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February 20, 1961

Electrical World

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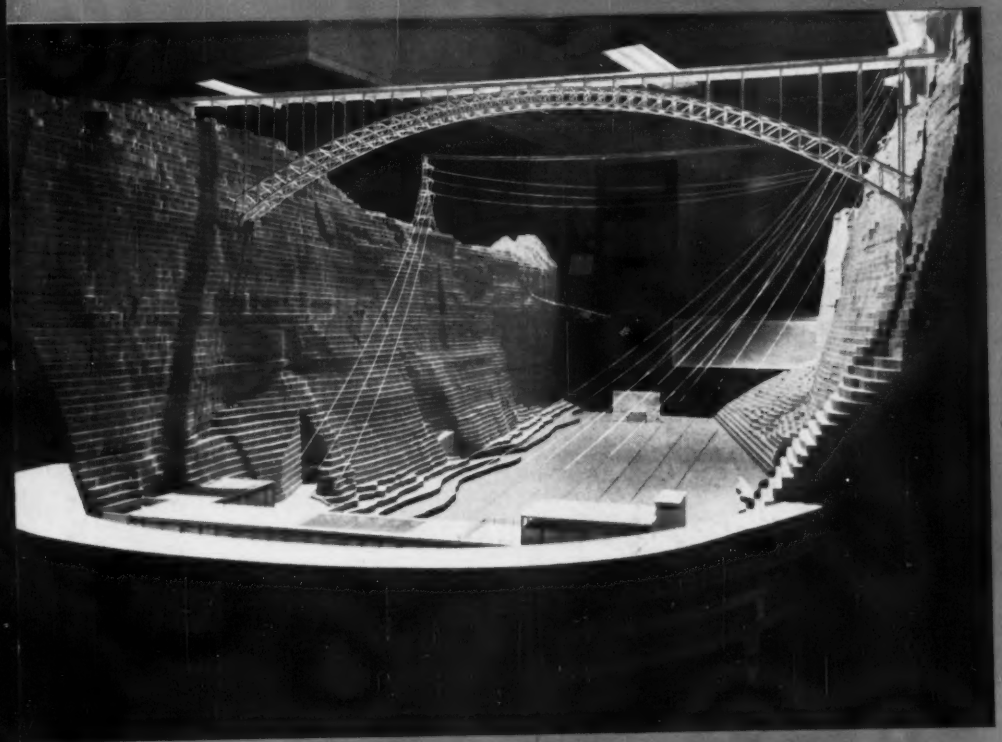

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. . . page 34

Glenn Warren Talks On Future Turbines . . . p 38

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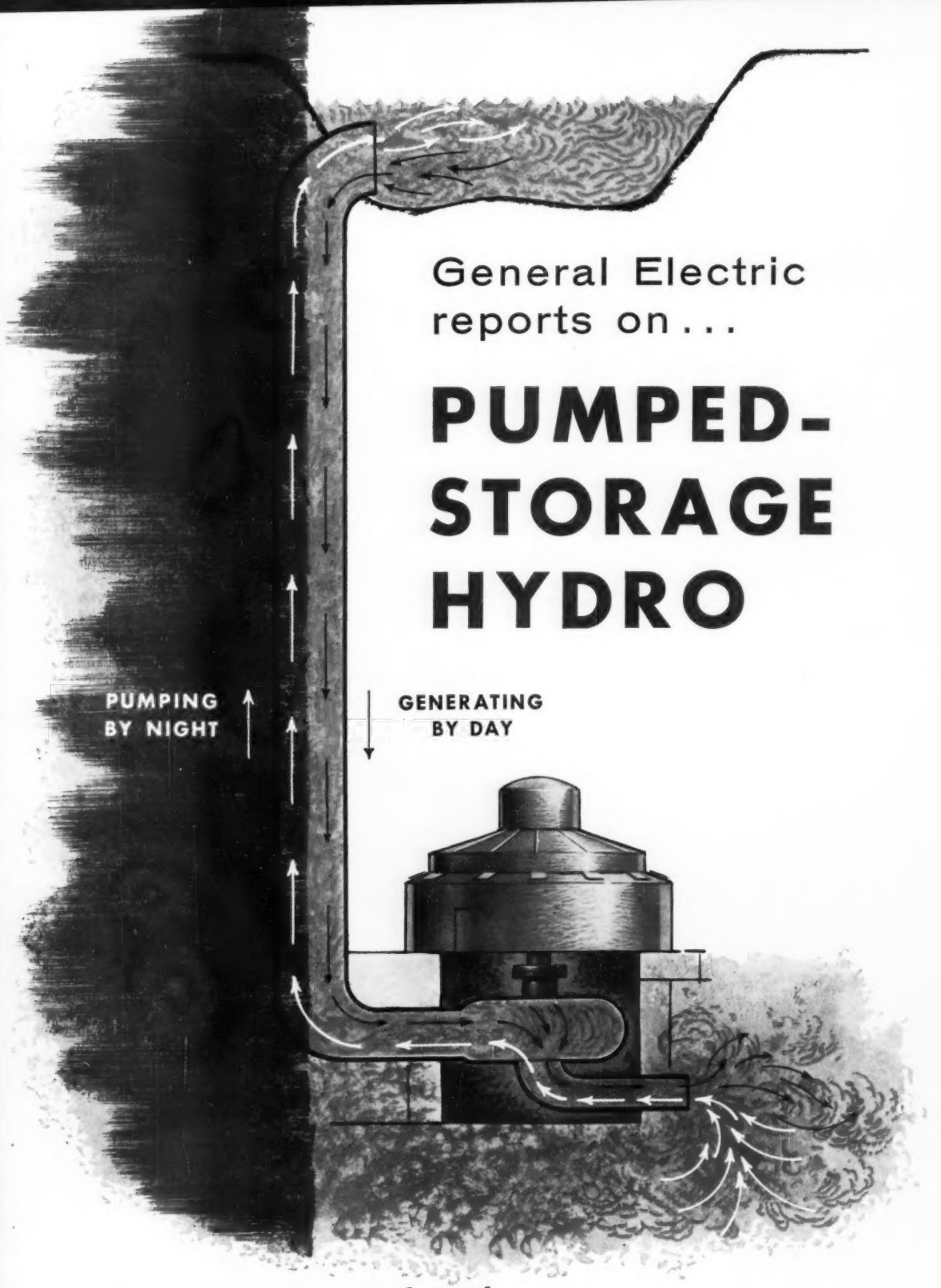


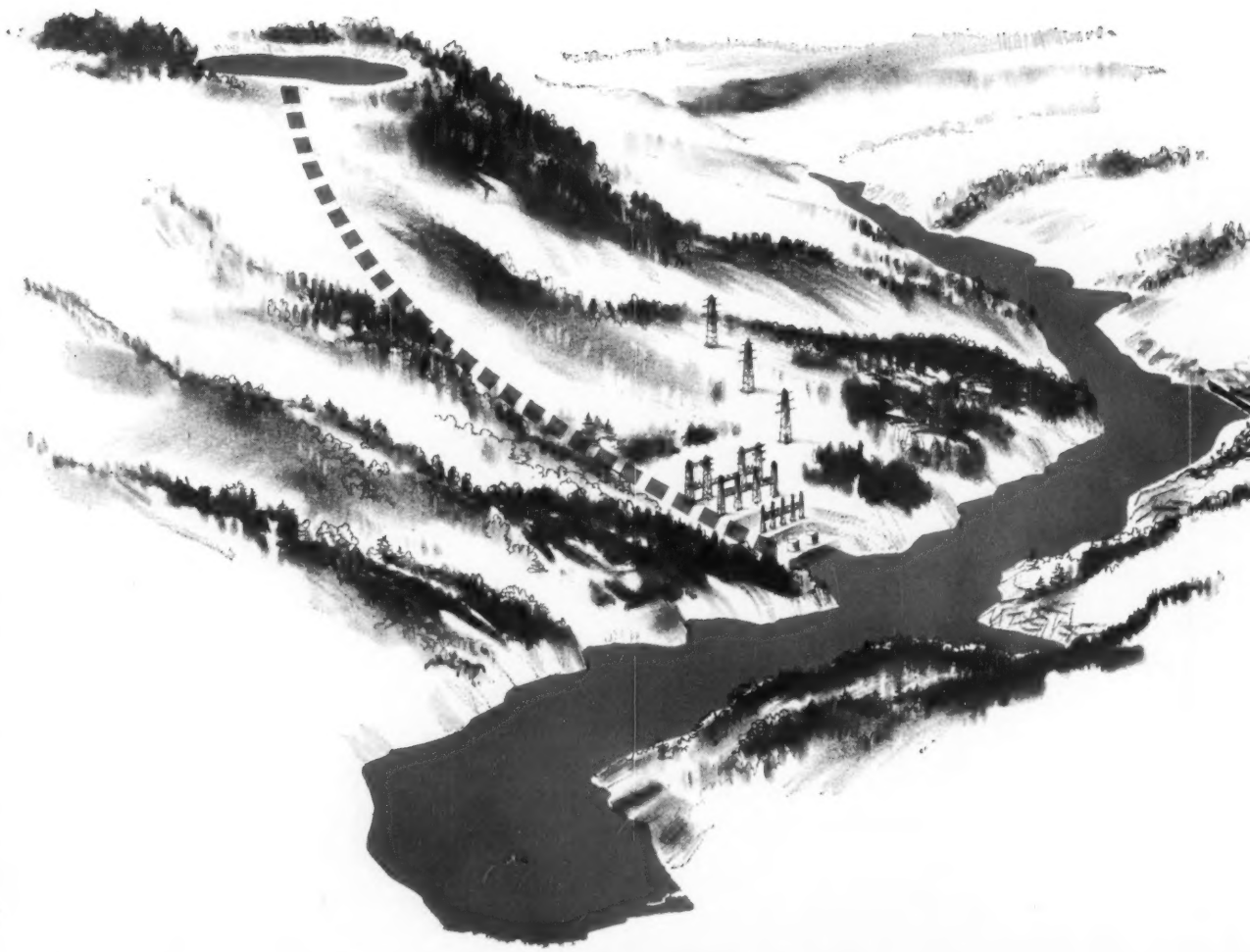
General Electric
reports on...

PUMPED-STORAGE HYDRO

an economical
approach to peaking

UNION ELECTRIC COMPANY'S TAUM SAUK PROJECT...

the world's largest pumped - s



TAUM SAUK involves the creation of two lakes in the Missouri Ozarks—one at the confluence of Taum Sauk Creek and the East Fork of the Black River, the other covering about 50 acres on top of a nearby mountain 800 feet above the lower lake.

HIGHLY POLISHED SURFACE of thrust bearing runner plate assures dependable operation of G-E hydro-generators. In operation, comparable bearings are supporting loads of over 4,000,000 pounds. Watching the operator check surface smoothness are R. B. Bodine (left) and R. B. McKeeby of G.E.'s Large Motor & Generator Dept.

storage plant will provide economical peaking

Union Electric Company, after six years of intensive study, recently initiated its Taum Sauk project—the world's largest pumped-storage hydroelectric power development, to be completed in 1963. Pumping water to a mountain-top reservoir by night and releasing the water by day to generate 350,000 peak-load kilowatts, Taum Sauk will serve as an economical addition to the Union Electric system.

ECONOMICAL PEAKING

- By building Taum Sauk (estimated to cost $50 million), Union Electric can postpone for two years the construction of an $80 million steam plant.
- Two valuable peak-load kilowatt-hours will be delivered for each three off-peak kilowatt-hours supplied, at fuel cost only, by otherwise idle steam units. More continuous use of its steam units will let Union Electric spread fixed costs for operation and maintenance over a greater kilowatt-hour output.
- Water held in the mountain-top reservoir will represent instantaneous reserve in case of unexpected breakdown of other generating equipment.
- Lower maintenance costs, savings associated with automated operation, and longer service life are typical hydro-plant benefits available to Taum Sauk.

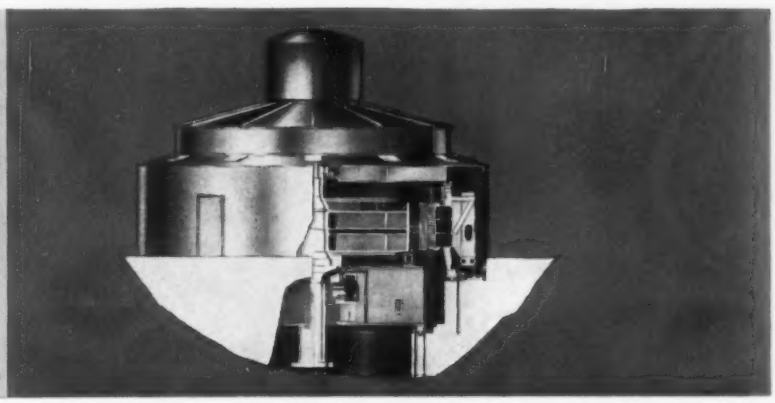
PARTNERSHIP IN INNOVATION

General Electric, as supplier of the world's largest generator/motors (204,000-kva, 240,000-hp) for Taum Sauk, is proud to be associated with Union Electric in this ambitious undertaking. Taum Sauk is a significant example of the partnership of electric utilities and manufacturers in the search for new and better ways to serve growing loads while keeping the cost of power low.

TREND TO HYDRO

More and more hydro plants, both pumped-storage and natural-head, will be constructed in the future to meet peak-load requirements. The reason: energy costs are reduced by better utilization of larger steam units and nuclear plants, which are operated most economically at base load. General Electric, which has supplied more than 2000 hydro-generators during the past 75 years, is well-qualified to work with you on your hydroelectric project. Call your G-E Sales Engineer or request bulletin GEA-2251F from General Electric Company, Section 604-15, Schenectady 5, N. Y.

THIS CROSS-SECTION illustrates one of the G-E reversible generator/motors to be furnished for Taum Sauk. At night, these generator/motors will use off-peak power from the system's steam equipment to turn the blades of two hydraulic turbines, pumping water from the lower level, through a tunnel, to the mountain-top reservoir. During daytime peak periods, the water is released from the mountain-top "storage battery," and the equipment is reversed to generate 350,000 kw for as long as eight hours.



Progress Is Our Most Important Product

GENERAL ELECTRIC

Published for 87 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Electrical World

FEBRUARY 20, 1961

Vol. 155, No. 8

Electrical What in the World . . .

Speech writing sometimes can be a chore, especially when one indulges the human frailty of letting it go until the virtual eve of the event. Yet, during the research which must go into such activity, it is rare that some gem of an idea isn't mined out as a byproduct. Such was the case for us recently, and it fits right in with a long-harbored annoyance of ours.

It seems to us that the gas industry has been getting a lot of play recently with regards to its terrific growth, and some people are beginning to accept the thesis that gas has done better than electricity in this regard. But we've come up with a few numbers which we think disproves the thesis completely, at least over the full span of the postwar period, 1945-1959.

Over this interval, total (all classes) gas sales have trebled, and total kwhr have matched this growth, almost to the decimal point. Gas residential customers grew 58%; electric residentials increased 74%. Annual usage per residential gas customer went up 53%; electrical residential usage lifted 190%. Average per therm price of residential natural gas rose 48%, while residential average price per kwhr was dropping 26%.

This record shows that, despite the wide spreading of natural gas over the country in this period, its performance has been overshadowed by electricity.

Still, we caution that records are but shadows of the dead past: the future is what counts. Growth is our salvation, and growth must be worked for. It's necessary to remind ourselves constantly that our growth rate is not built-in.

Chuck Hochgesang

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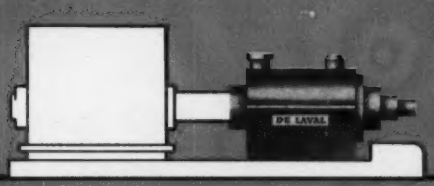
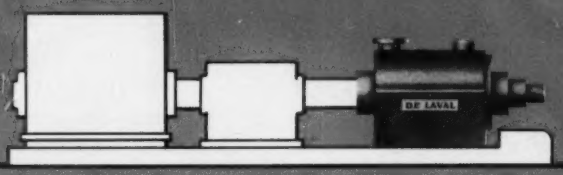
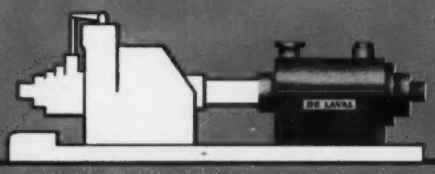


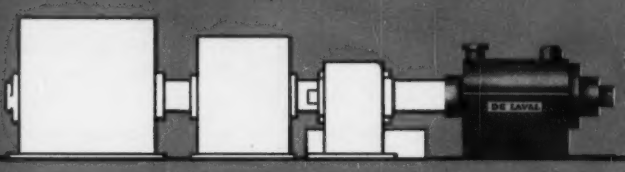
Motor-Hydraulic Coupling Drive
Commonwealth Edison Co.
5000 HP 325 MW



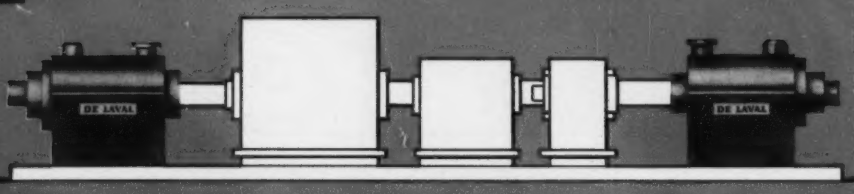
Turbine Drive
United States Steel Corporation
1400 HP 44 MW



Motor-Magnetic Coupling—Gear Drive
South Carolina Electric & Gas Co.
2500 HP 5100 RPM
125 MW



Supercritical Cycle
American Electric Power System
4000 HP 6500 RPM 5500 PSIG 120 MW



Main Generator-Shaft Drive
Commonwealth Edison Co.
4900 HP 325 MW
(FUTURE UNIT)

Main Turbine-Shaft Drive
Pacific Gas & Electric Co.
5250 HP 330 MW

DE LAVAL STEAM TURBINE COMPANY
861 NOTTINGHAM WAY, TRENTON 2, N. J.

Letters

Executive Has Nothing To Do

To the Editor:

As I read the "Management Newsletter" in your Dec. 19 issue (p 119), dealing with the responsibilities of those in charge of important business and utility operations, I was reminded of a little piece which was handed to me by my boss many years ago, in fact in the middle 1930's. I do not know the author nor where it was published. Perhaps you have seen it before:

As everybody knows, an executive has practically nothing to do. That is, except:

To decide what is to be done; to tell somebody to do it; to listen to reasons why it should not be done, why it should be done by somebody else, or why it should be done in a different way, and to prepare arguments in rebuttal that shall be convincing and conclusive.

To follow up to see if the thing has been done; to discover that it has not been done; to inquire why it has not been done; to listen to excuses from the person who should have done it and did not do it.

To follow up a second time to see if the thing has been done; to discover that it has been done, but done incorrectly; to point how it should have been done; to conclude that as long as it has been done, it may as well be left as it is; to wonder if it is not time to get rid of a person who cannot do a thing correctly.

To consider how much simpler and better the thing would have been done had he done it himself in the first place; to reflect sadly that if he had done it himself he would have been able to do it right in twenty minutes but that as things turned out he himself spent two days trying to find out why it was that it had taken somebody else three weeks to do it wrong; but to realize that such an idea would strike at the very foundation of the belief of all employees that an executive has nothing to do.

Do you think it fits in with your discourses?

Edwin Fleischman
Consulting Engineer
605 Market St
San Francisco 5, Calif.

Dateline . . .

Portland, Ore.—Howard Morgan, the former Oregon public utilities commissioner named by President Kennedy to the Federal Power Commission, has made few friends among investor-owned power officials of the Pacific Northwest.

But Morgan, a contentious man whose path through Oregon politics has left many wounded spirits behind him, has foes on the public power side of the ledger, too. Among them has been C. Girard Davidson, one time Undersecretary of Interior and avid Hell's Canyon advocate. Davidson, a drafter of the Democratic party plank on power, greeted news of Morgan's appointment unsmilingly.

"I feel there are others who are as well or better qualified and far more deserving politically," said Davidson.

Surprise was a general reaction to the appointment, for Morgan's experience and personal interest has been more with transportation utilities than in power and his political preference up to the Democratic convention was more Stevenson than Kennedy.

Some Oregon electric utility executives who have crossed swords with Morgan thought first reports of his appointment were confused and that he had actually been appointed to the Interstate Commerce Commission. It may have been wishful thinking. In his two years as Oregon utilities com-

(*Continued on page* 30)

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new lifetime VINYL coating on all **RT&E** transformers AT NO ADDITIONAL COST!

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Write or phone your RT&E representative for the winter issue of the Concentration quarterly.

ARMORTEC . . .
100 TIMES BETTER THAN PAINT

Effective February 15, 1961, R T & E pole-type transformers will have ARMORTEC . . . a lifetime protective coating.

ARMORTEC is not a paint, it is a pure vinyl plastic. Oven-fused to the transformer cover, band and tank. ARMORTEC provides a thick protective coating that defies wear and weather even under the most tortuous atmospheric conditions. Thousands of hours of grueling laboratory testing proved ARMORTEC corrosion-proof, fade-proof, weather-proof, and maintenance-free. Tested in the salt air of Florida and the sand air of Arizona for over three years, ARMORTEC proved indestructible against salt spray, abrasion and sunlight.

ARMORTEC provides many more benefits, too:

- **Armortec coated cover and band eliminates outages due to birds and animals.**
- **Impact resistance that prevents chipping and scratching.**
- **Abrasion resistance 100 times superior to paint as proven by sandblast tests.**
- **A smooth, brilliant lifetime lustre that won't chalk, crack or craze.**
- **A fused-on film seal that eliminates bubbling and edge pull; provides uniform thickness even on corners; fills blind spots and corrosion traps present around lifting lugs, hanger brackets and accessories.**

ARMORTEC — the truly lifetime coating — will save you countless maintenance dollars through the years. And best of all, R T & E ARMORTEC is available to you *at no extra cost!*

Here again is another innovation in a long line of R T & E firsts — the result of **R T & E concentration on a single idea . . . build a better transformer for you.**

ask your
RT&E
representative
to torture test
RT&E
ARMORTEC
in your office!

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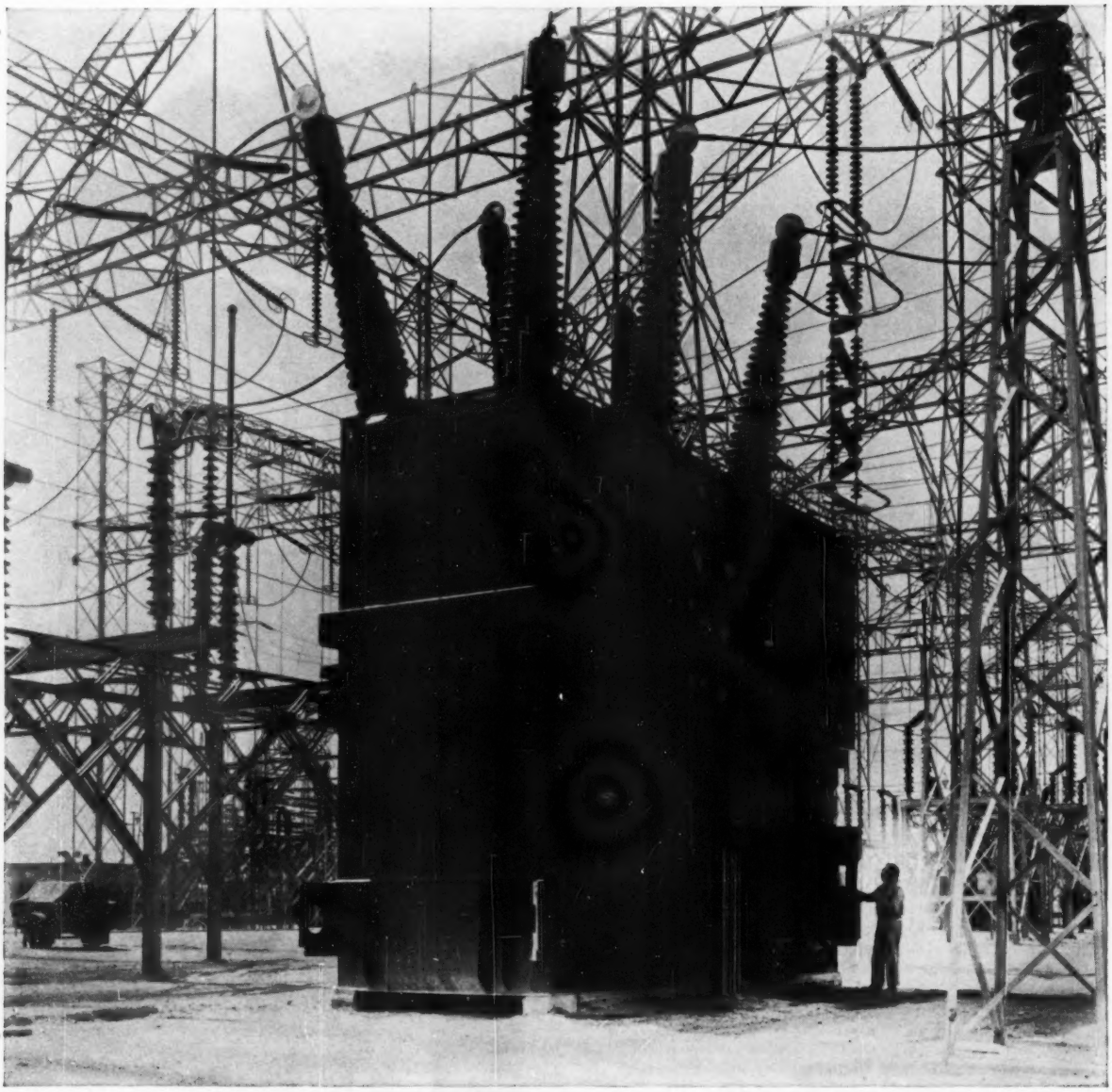
CORPORATION

WAUKESHA, WISCONSIN
PORTLAND, OREGON
ARLINGTON, TEXAS



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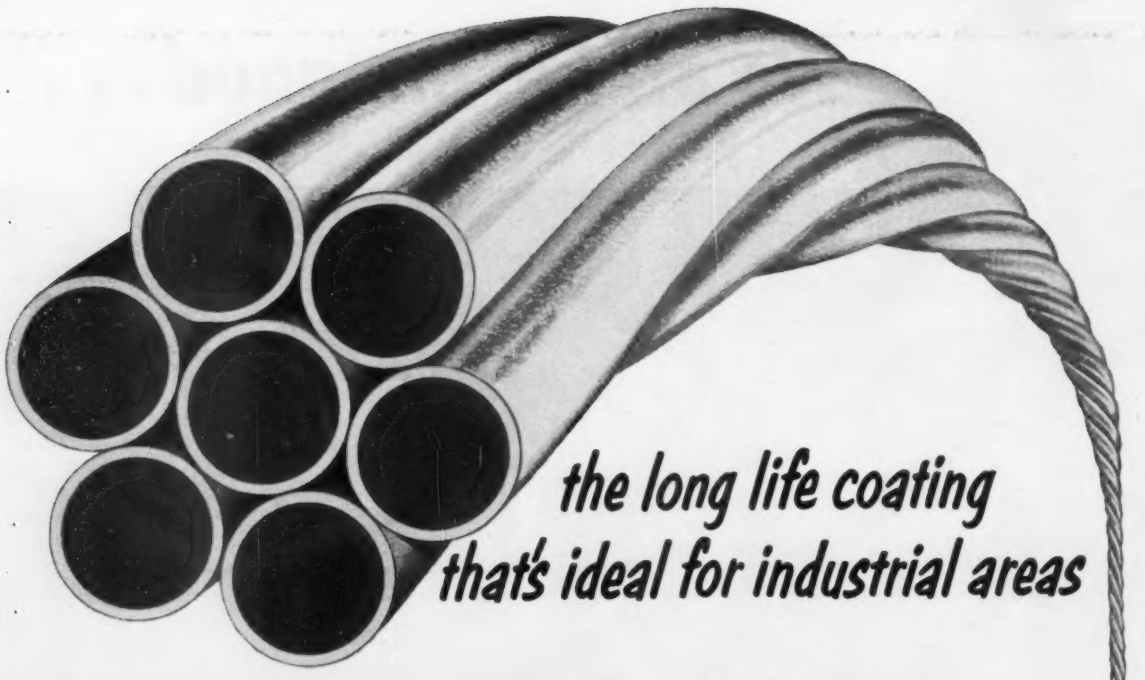

the long life coating that's ideal for industrial areas

BETHALUME STRAND

Bethalume Strand, a new hot-dipped strand made by Bethlehem, has the lasting strength of steel, combined with an aluminum coating for protection against corrosion. The Bethalume coating is uniform and tightly bonded to the steel, providing the strand with excellent weathering characteristics under most atmospheric conditions.

We've just printed a two-color folder describing Bethalume Strand. If you would like to have a copy, call the nearest Bethlehem sales office. Ask for Folder 777.

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. . . Economy
. . . Versatility

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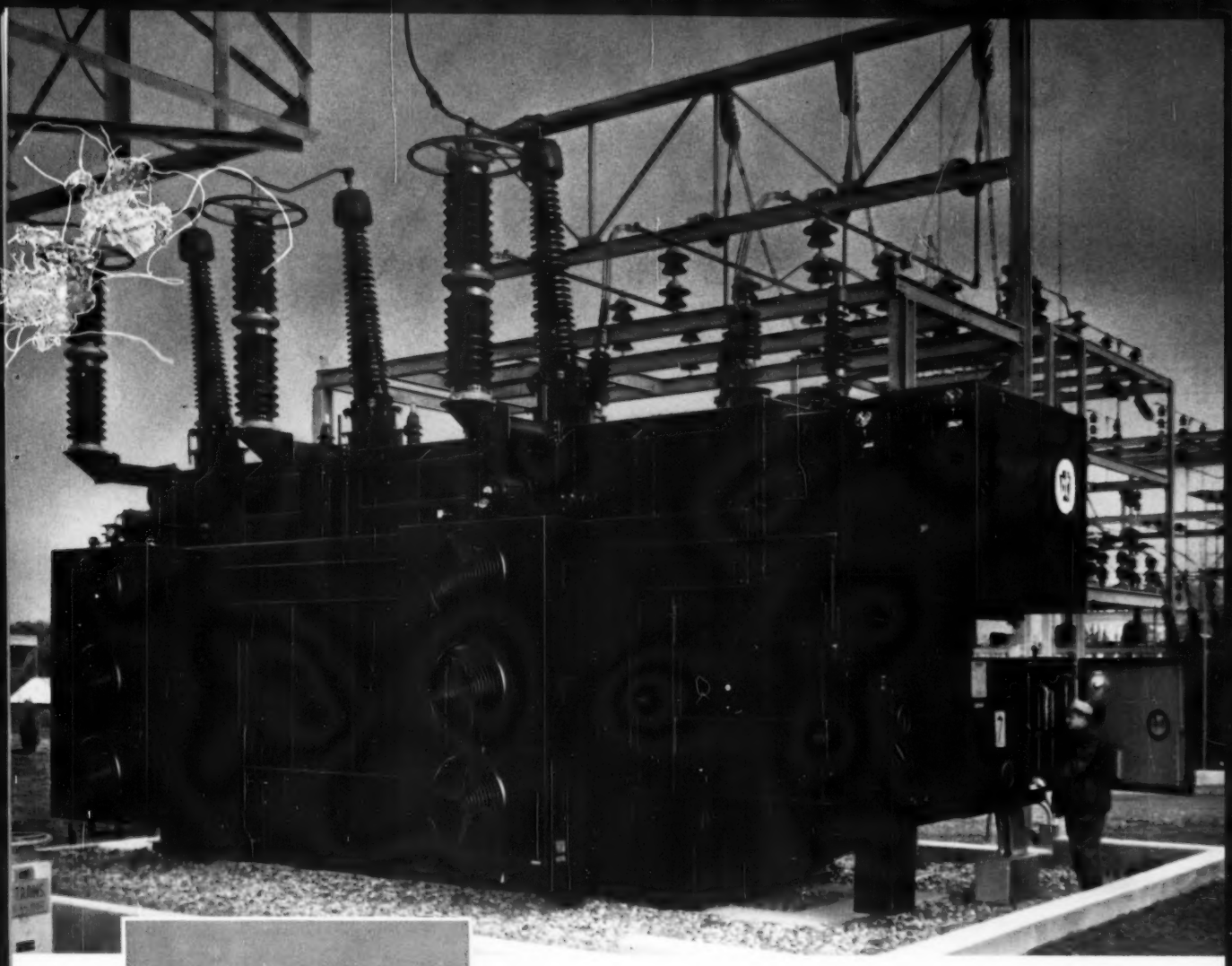
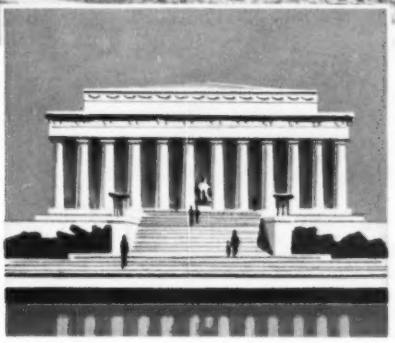




150,000-kva Monument to Service . . .

Pennsylvania LTC Transformer steps down 230 kv for Potomac Electric's Washington-district lines

Located in an area where statuary and monuments abound, Potomac Electric Power Company's Takoma Park Substation could be termed a "monument" to service-minded public utilities. Its growth exemplifies the extensive and rapid expansion an electric utility must undergo to meet the challenge of population "explosion."

The station is in Prince George County, Maryland, a few miles from the northeastern border of the District of Columbia. The area has experienced exceptional growth, with shopping centers and light industrial plants adding to the load created by new apartments and houses. Since World War II, Potomac Electric Power has added 380,000 kva to Takoma Park's transformer capacity. The total capacity is now 440,000 kva.

The latest addition is a 150,000-kva Pennsylvania Load Tap Changing Transformer, which steps down the voltage of a new 230-kv line for Potomac Electric's main 69-kv transmission system. A combination of high kva and high voltage makes this one of the largest LTC transformers Pennsylvania has built. Thanks to its compact shell-form Contour Design, however, the transformer was shipped to its destination upright and completely assembled except for bushings, heat exchangers, and other external accessories.

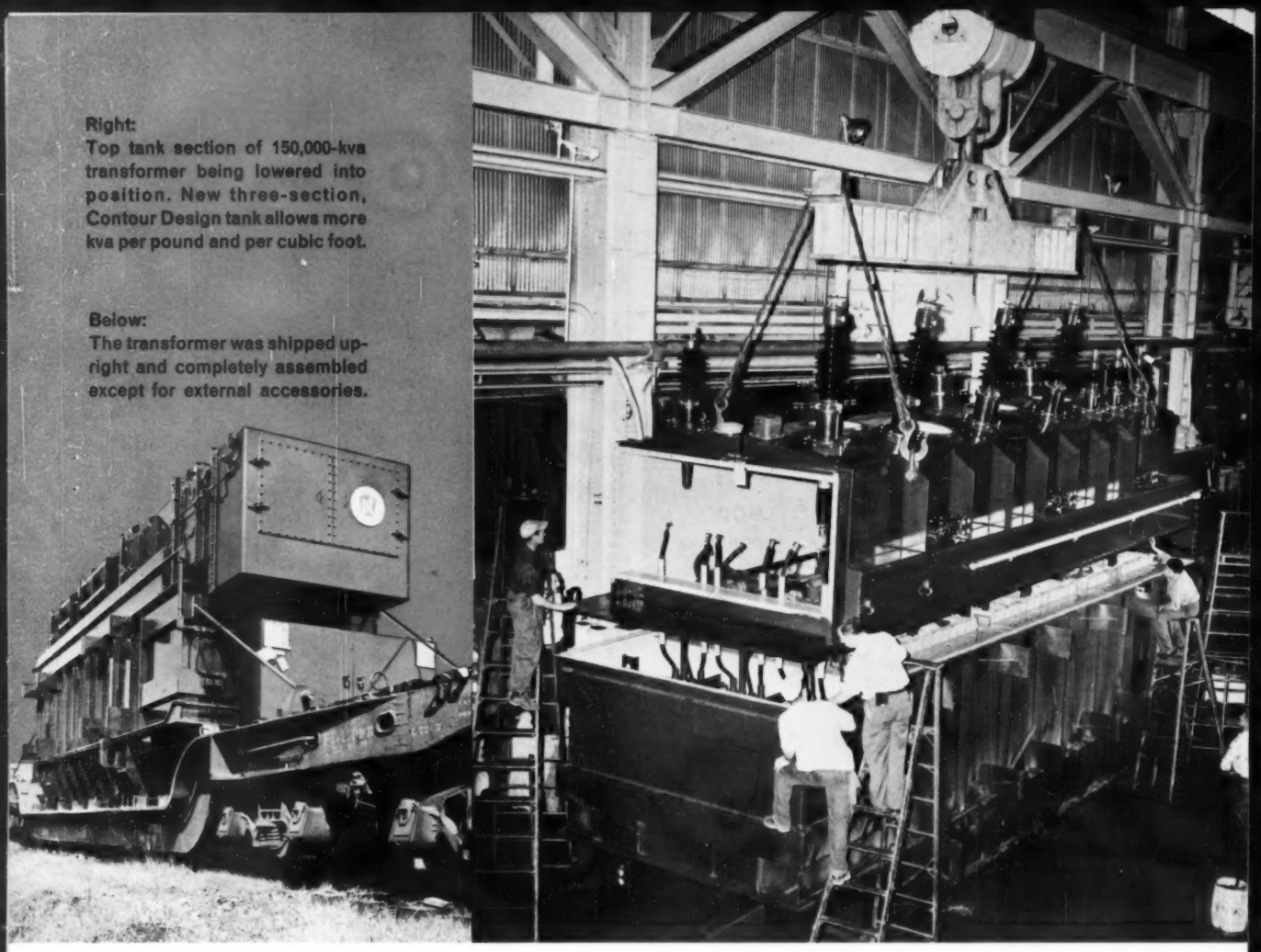
A new booklet describing the construction and advantages of Pennsylvania Contour Design Transformers is now available. For a copy—or a conference regarding specific requirements—write to Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pa., or contact the nearby Pennsylvania Transformer sales representative.

PENNSYLVANIA POWER TRANSFORMERS

See other side for design details

Right:
Top tank section of 150,000-kva transformer being lowered into position. New three-section, Contour Design tank allows more kva per pound and per cubic foot.

Below:
The transformer was shipped upright and completely assembled except for external accessories.



Now. . . more kva per pound and per cubic foot in Pennsylvania Contour Design power transformers

NEW 3-SECTION TANK

reduces sound level, too!

Pennsylvania shell-form Contour Design transformers are now lighter, more compact . . . and structurally stronger . . . as a result of a new three-section tank design. The core and coils are assembled in the base section *without the use of a separate frame.* The center tank section, when added and welded into place, provides sturdy side bracing for the internal assembly.

Before the top section is added, the core is clamped to the bottom section by means of closely spaced jack screws. Careful control of the jack-screw pressure reduces the sound level of the entire structure . . . assuring even quieter operation than heretofore.

The 150,000-kva, 230-kv transformer shown above and on the reverse side demonstrates a prime advantage of Pennsylvania's new size-and-weight-reducing Contour Design. A combination of high kva and high voltage makes this one of the "largest" load tap changing transformers Pennsylvania has built . . . yet it was shipped upright and completely assembled except for external accessories.

Now in service for Potomac Electric Power Company, the transformer includes LTC equipment for plus or minus 10% regulation in 32 steps of ⅝% each—all at full capacity. The 69-kv secondary and 13.8-kv tertiary may be loaded simultaneously.

PENNSYLVANIA TRANSFORMER DIVISION
McGRAW-EDISON COMPANY • CANONSBURG, PA. • GREATER PITTSBURGH DISTRICT

See other side for installation view

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NEXT WEEK

DON'T MISS part two of Electrical World's 57th Annual Statistical Report.

LATE NEWS ▶

Farm electrification research lab is proposed in bill by Sen Hubert Humphrey. Bill, now in Senate Agricultural Committee, would study ways of increasing efficiency of electric power on farms, where Humphrey claims "We have only scratched the surface."

USBR regional office in Denver goes on 10-hr day to speed designs and specifications of multipurpose dams, with Pres Kennedy has ordered accelerated as part of anti-recession program. Bureau spokesman says other regional offices may be speeded-up if work load requires it.

Nine public power groups answer AEC's second call on 50 Mw organic moderated and cooled prototype reactor. Among the respondents are 12 municipals, nine co-ops, one county system, and one state system including groups from Vt., Texas, Ohio, Md., Wis., Miss., Okla., Nev., and N. M. In offer to public power groups, AEC will pay for reactor and its operation and train operators. Utility would provide site, conventional generating equipment, and other non-nuclear portions. In AEC's 1959 offer to investor-owned companies, winner would have had to pay nuclear costs.

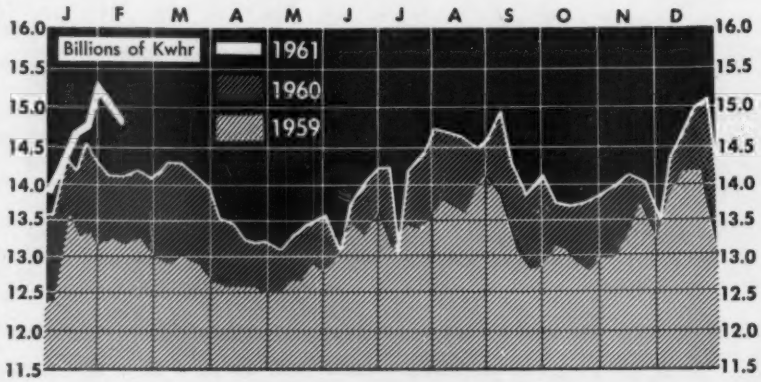
US government claims AEC construction permit for Power Reactor Development Corp complies with Atomic Energy Act. Asking US Supreme Court to overturn Appeals Court ruling in favor of IUE contention that atom plant was too close to thickly populated area, government maintains AEC's safety findings were not abiguous, but only the result of two-stage safety study.

Latest REA estimates say 96.5% of nation's farms are now electrified. New estimate, which includes Alaska and Hawaii, shows 43 states with over 90% of rural areas served by central station power. Indiana, New Jersey, and Michigan head the list, all with over 99%. Alaska (61.9%) and Hawaii (67%) are lowest, with Nevada (81.2%) lowest in contiguous US.

Kansas legislature gets bill to regulate municipal system operation outside city limits. Under present law, investor-owned and co-op systems are regulated; municipals are not. Proposal would not affect rates or in-city operations.

USBR awards $3-million contract for two new federal transmission lines carrying power from Corps of Engineer 595-Mw Oahe, S.D., Dam. One 230-kv line will run from Fort Thompson, S. D., to Watertown, S. D. substations; the others, from Fort Randall Dam switchyard to Fort Thompson and Sioux City, Iowa, substations.

WEEKLY POWER OUTPUT—Up 4.0% (Week ending Feb. 11), Kwhr 14,744,000,000



Per Cent Change From Previous Year

	Jan. 28	Feb. 4	Feb. 11
Total U. S.	+ 6.5	+ 6.1	+ 4.0
New Eng.	+10.9	+10.2	+ 5.4
Mid. Atlan.	+ 8.0	+ 8.6	+ 5.3
Cent. Indust.	+ 0.2	+ 0.2	− 2.4
West Cent.	+ 8.2	+ 8.5	+ 5.3
Southeast	+10.5	+ 9.6	+ 7.5
South Cent.	+ 7.4	+ 5.9	+ 7.3
Rocky Mount.	+13.3	+13.4	+13.2
Pacific			
NW	+ 5.6	+ 6.1	+ 3.1
SW	+ 7.3	+ 4.6	+ 5.2

Seasonally Adjusted Index 278

Week Ago 281 Year Ago 265

Source: Edison Electric Institute

CUSTOMERS LOOK INTO ANTITRUST DAMAGE SUITS; OTHERS COMMENT

Suppliers involved in the Philadelphia antitrust actions (EW, Feb. 13, p 48) continued their preparations against possible damage claims from customers last week amidst a background of developments and pronouncements:

• **President John Kennedy at his weekly news conference said** he thought "it would be very beneficial if business groups today would consider what they could do to protect themselves from charges of conflict of interest that we have recently seen, and also of the effort made by these large electrical companies to defraud the government."

• **Attorney General Robert Kennedy confirmed previous reports** that the government was preparing damage suits and expected to file the first complaint within two months. Under antitrust laws, federal agencies can sue only for single damages, although they can try for double damages under the False Claims Act. As for TVA, there is now the possibility that the government will try for treble damages, because, in the words of a Justice Department lawyer, "TVA is a corporation."

• **And Sherman R. Knapp, president of Connecticut Light & Power Co** and of Edison Electric Institute, commented recently that "all of the electrical utilities are very much concerned about the situation . . . However, this is a problem of each individual utility." Referring to CL&P, Knapp said his company was "giving thorough study to the purchases from manufacturers involved . . . As soon as our study is completed, we will determine what action our company should take to protect the interests of our stockholders, customers and the public at large."

• **The National Institute of Municipal Law Officers,** made up of city attorneys, said it is considering a large consolidated treble damage suit on behalf of about 180 cities around the country. (Any parties other than federal agencies, can sue for treble damages.)

• **Independently, cities around the country,** including New York, Chicago, Boston, Milwaukee, and Los Angeles, said they are studying their purchases and contemplating damage suits. San Francisco said it is working towards an out-of-court settlement by negotiating with General Electric Co, Allis-Chalmers Manufacturing Co, Westinghouse Electric Corp, and Federal Pacific Electric Corp.

• **In Atlanta, Mayor B. Hartsfield said his city would not "join the crowd"** talking about suing the electrical equipment suppliers. "If every city sued every price fixer, large and small, including the payola boys, there would not be enough courthouses and lawyers to carry on the litigation," the mayor noted. "Of course, such traits of national character must be deplored, but remedied through greater national application of the Golden Rule to us all."

• **Sen Kenneth B. Keating (R-N.Y.) said that customers of electric utilities should share in any damages collected** from the manufacturers. In a letter to James A. Lundy, chairman of the New York State Public Service Commission, Keating said that if equipment prices were higher because they were non-competitive, consumers "indirectly paid for the purchase of this equipment through their monthly electric bills." He suggested that the commission review any judgments awarded to utilities "to determine whether an adjustment of the rates charged to consumers would be appropriate."

• **In Colorado, Joseph Nigro, chairman of the Public Utilities Commission** said he would expect any utilities with a claim against any of the 29 manufacturers involved to take steps to recover all that they are entitled to. "Rebates (to consumers) would be a difficult problem to handle," he said, "but any substantial recovery would certainly affect future rates."

• **In Peoria, two attorneys filed a suit in a Federal District Court** asking damages of $750 million from General Electric for alleged injury damages to 50 million consumers. The suit, which is termed by lawyers as a "class action," was called "fantastic" by General Electric, especially since it referred to consumer products.

• **In California, four utilities have hired a Los Angeles law firm** to help them determine whether there have been any overcharges for electrical equipment, and if so, whether they should sue. The companies are Southern California Edison Co, Pacific Gas & Electric Co, San Diego Gas & Electric Co, and California Electric Power Co.

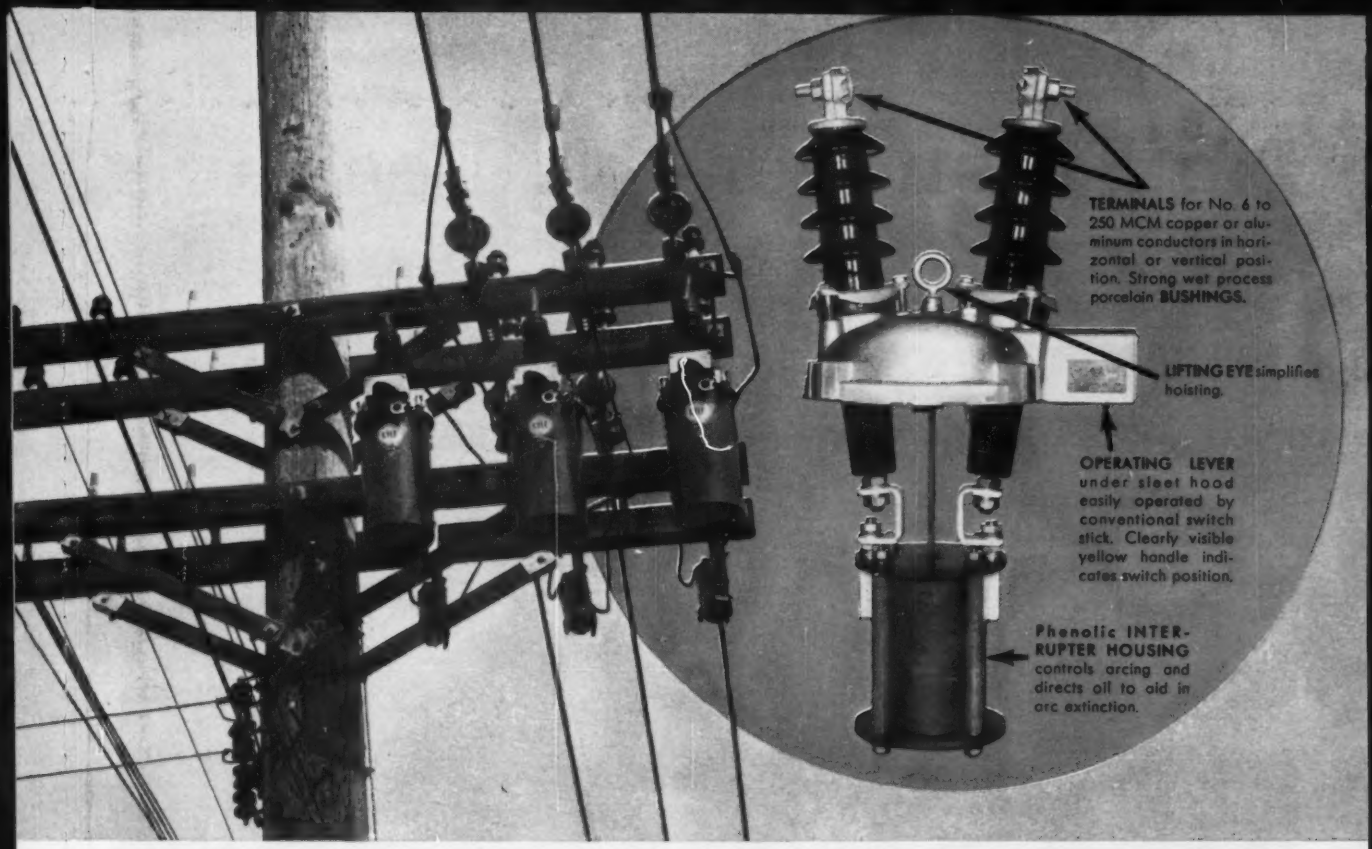
In the meantime, manufacturers involved were checking their own books to see if any customers are entitled to damages. The three largest companies, GE, Westinghouse, and Allis-Chalmers, have already announced that they would make voluntary studies with customers. To head these studies, GE brought back its former president, Charles E. Wilson; Westinghouse named George L. Wilcox, former president of Canadian Westinghouse and now a vice president and assistant to the president of the parent firm; and Allis-Chalmers appointed Chester W. Schweers, vice president and assistant to the president. Like virtually all the other manufacturers involved in the Philadelphia cases, these three feel that prices were not kept unreasonably high by the conspiracies, and expect their studies will show this. In fact, the president of a medium sized company says "this thing won't cost us a good lunch."

To back up statements such as this, some manufacturers say they are prepared to show the slim profits they realized during these conspiracies. Others claim they incurred losses during the same period. In the meantime, rather than approach customers voluntarily, many manufacturers will wait for the customers to make the first move. Some of these suppliers entered only pleas of *nolo contendere* in Philadelphia. Because in this type plea guilt is not legally established, these manufacturers feel somewhat immune from future civil damage claims.

In a related move, Westinghouse has announced that it is setting up a new antitrust section within the company's law department and at the same time enacting an enforcement plan to assure future compliance with antitrust laws. In addition, the company is adding the following paragraph to its existing policy on legal and ethical conduct:

"Any clear infraction of the applicable laws or of recognized ethical business standards will subject an employe to disciplinary action, which may include reprimand, probation, suspension, reduction in salary, demotion or dismissal—depending on the seriousness of the offense. Clear-cut price-fixing or bid-rigging acts or illegal activities with competitors to divide or allocate markets or customers will result in dismissal."

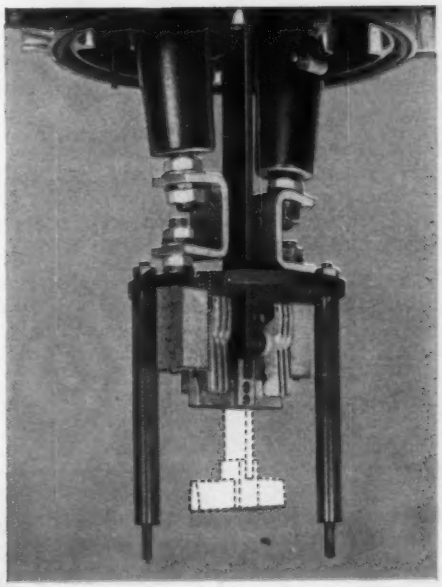
Westinghouse says this rule will not be applied to the acts by individuals involved in the present antitrust actions.


TERMINALS for No. 6 to 250 MCM copper or aluminum conductors in horizontal or vertical position. Strong wet process porcelain BUSHINGS.
LIFTING EYE simplifies hoisting.
OPERATING LEVER under sleet hood easily operated by conventional switch stick. Clearly visible yellow handle indicates switch position.
Phenolic INTERRUPTER HOUSING controls arcing and directs oil to aid in arc extinction.

Light weight and compact design make it easy to install the Type J Switch at almost any convenient location.

New Manual 400 Ampere Oil Switch Easily Breaks Rated Load Currents

L-M's new Type J Single-Phase Manually Operated Oil Switch is dependable, rugged, economical, easy to install



This new 14.4 kv, 110 kv BIL, 400 ampere manual oil switch was designed at the request of a utility that needed a load break oil switch of this rating.

The heavy-duty contact mechanism operates under oil. It safely interrupts load currents up to 400 amperes at power factors down to 75% lagging.

Operation is manual, by means of the operating lever under the sleet hood, and a switch stick. The simple, sturdy construction and fast break contact mechanism assures minimum maintenance.

Ask the L-M Field Engineer for Product Bulletin. Or write Line Material Industries, Milwaukee 1, Wisconsin. In Canada: CLM Industries, McGraw-Edison (Canada) Limited, Toronto 13, Canada.

LINE MATERIAL Industries

McGRAW-EDISON COMPANY

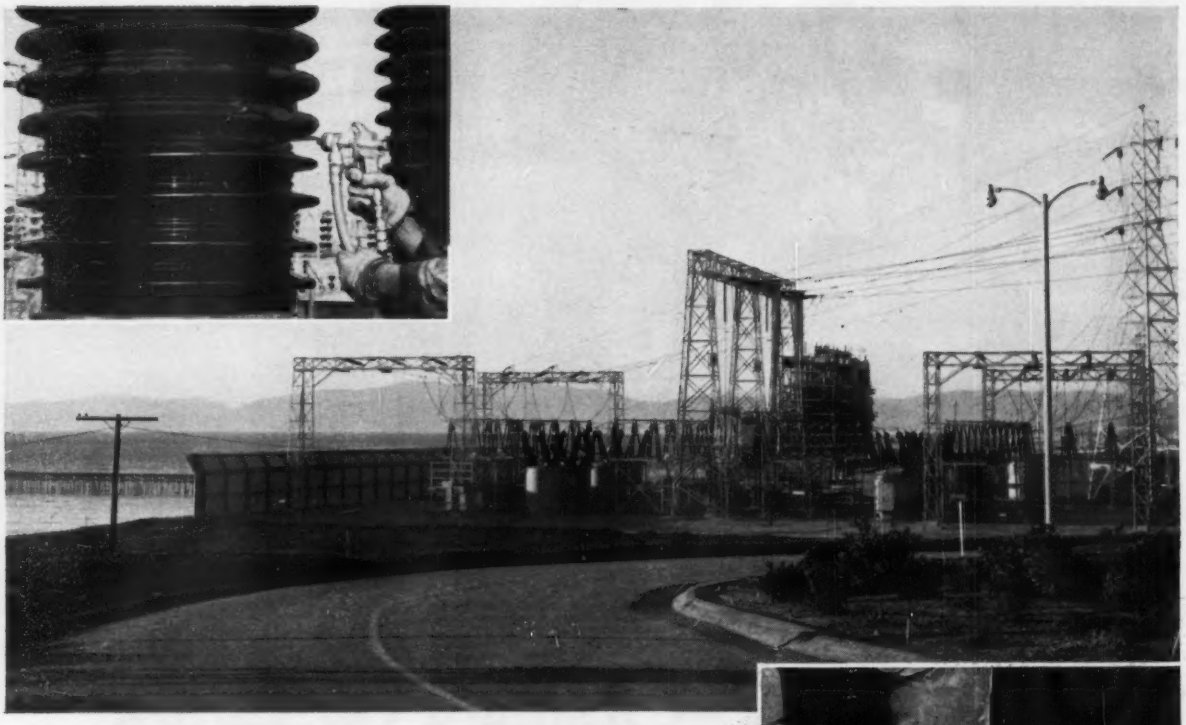
Reclosers, Sectionalizers, and Oil Switches

McGRAW EDISON

459

SILICONE NEWS from Dow Corning

No Flashover–No Leakage



Easy-To-Apply Silicone Coating Stops Arcing, Cuts Maintenance

With the wind-whipped Pacific Ocean less than 500 feet away, insulators in the switchyard of the El Segundo Steam Plant of Southern California Edison Company appear easy pickings for salt spray contamination . . . flashover . . . insulator leakage . . . lots of problems. But Southern California Edison has an effective and economical method for dealing with these contaminants.

An easily applied coating of Dow Corning 5 Compound causes mist, fog, spray and other moisture to "bead" and roll off without forming damaging conductive paths. The results: greatly reduced arcing and flashover damage to insulators; reduced service interruptions; reduced insulator maintenance costs.

Southern California Edison first applied Dow Corning 5 Compound on insulators in 1955. Insulators formerly washed down twice a month now require a silicone coating renewal only once a year. Outages and insulator damage have been eliminated while direct maintenance costs (labor and material) have been reduced.

Silicone compound can be applied with a rag or stiff brush . . . or recently developed spray equipment.

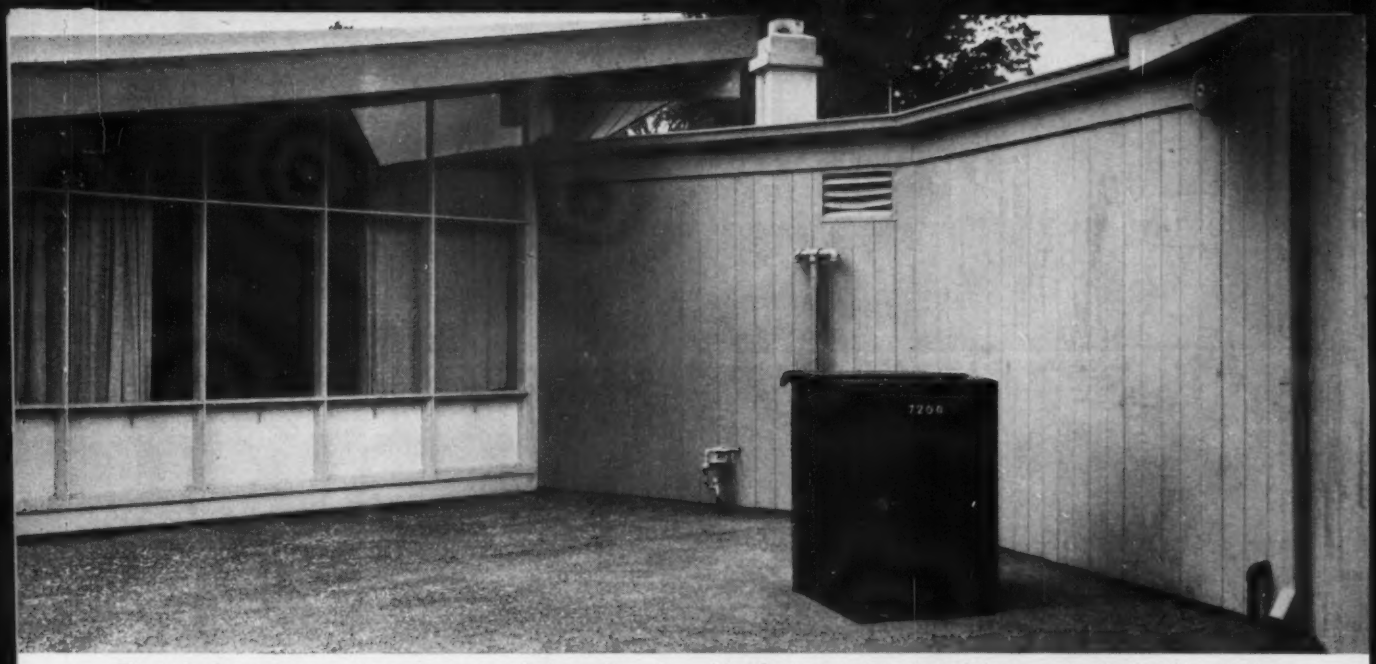
For free eight ounce evaluation sample, and information detailing how you can eliminate outages and insulator damage, write on your company letterhead to Dept. 3114.

The nearest Dow Corning office is your number one source for information and technical service on silicones.

first in silicones

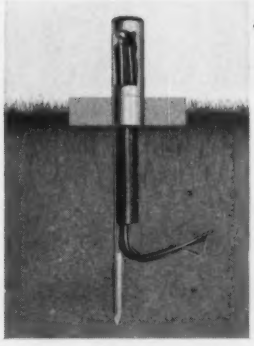
Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.



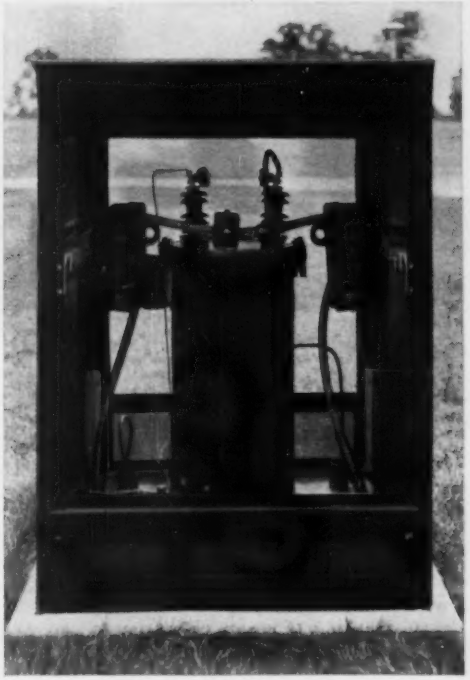
This is the *first* pad-mounted transformer installed anywhere in the United States by anyone. It is L-M's Pad-Mount®, Serial No. 1763851, shipped on March 17, 1958 and energized in June of that year at the Blackhawk School in Roselle, Illinois. Modifications in this original design make the Pad-Mount the most convenient, practical, and economical transformer of this type. In all distribution voltages, in ratings through 167 kva single phase and 500 kva 3-phase.

Wide Choice Of L-M Equipment Designed To Cut Costs Of Underground Distribution



L-M Power Pedestal, an L-M development, provides rainproof, tamperproof facilities for above-ground connection of cables. Several types available.

L-M low-cost Fault Indicator will save many hours of labor and outage time by instantly and visibly indicating the faulted section of cable.



The L-M Transclosure provides a ventilated, weatherproof, tamperproof housing for pole-type transformers, protective equipment, switches, etc. A convenient, economical bridge between overhead and conventional underground. May be ganged if desired. No de-rating of transformers. Note installation of Cable Fault Indicator.

Ask The L-M Field Engineer For Information

As the leader in designing equipment for underground distribution, L-M can provide a wide variety of experience on systems and apparatus. Ask the L-M Field Engineer for Application Bulletins, Test Data, and Product Information; or write Line Material Industries, Milwaukee 1, Wisconsin.

LINE MATERIAL® Industries

McGRAW-EDISON COMPANY

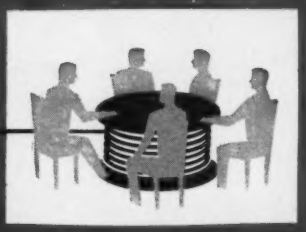
Underground Distribution Equipment

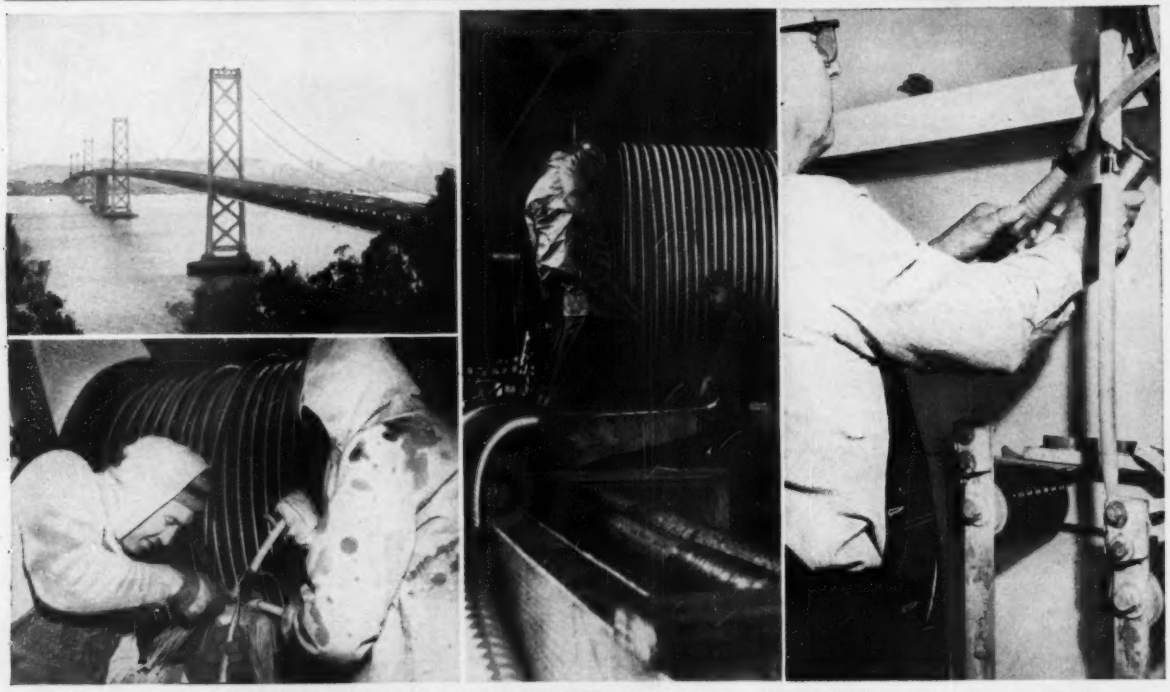
499

DISTRIBUTION TRANSFORMERS • RECLOSERS, SECTIONALIZERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE & CONDUIT

WIRE AND CABLE ROUND TABLE

DU PONT





Workmen install new 15KV cable insulated with ALATHON. The basic rewiring of the famous bridge involves the installation of two new primary circuits, which will conduct power to the two new roadway lighting systems.

General Electric 15KV power cable insulated with ALATHON® being installed at San Francisco Bay Bridge

A four-year reconstruction job, designed to increase traffic capacity by 25-35%, is under way at the famous San Francisco Bay Bridge. An important part in the renovation is the extensive rewiring of the roadway lighting system. To obtain maximum performance at minimum cost, engineers selected 11,000 feet of General Electric 15KV power cable insulated with Du Pont ALATHON polyethylene resin for the job.

The G-E cable utilizes the extremely low power factor and dielectric constant (2.28) of ALATHON. This assures a low dielectric loss and gives the cable a greater load-carrying capacity. And through extensive research, Du Pont has developed a corona-resistant ALATHON to insure even greater long-term reliability. Because of its superior electrical properties, the insulation of ALATHON can be thinner than other materials, making the cable lighter in weight. Thus shipping, handling and installation are easier and more economical.

Investigate how ALATHON and the other Du Pont plastics can help solve your wire and cable problems. Contact your wire and cable supplier or write: E. I. du Pont de Nemours & Co. (Inc.), Dept. EW-220, Rm. 2507A, Nemours Bldg., Wilmington 98, Del. *In Canada:* Du Pont of Canada Limited, P.O. Box 660, Montreal, Quebec.

POLYCHEMICALS DEPARTMENT

ALATHON® POLYETHYLENE RESINS | RULAN® FLAME-RETARDANT PLASTICS | ZYTEL® NYLON RESINS

DU PONT REG. U.S. PAT. OFF.

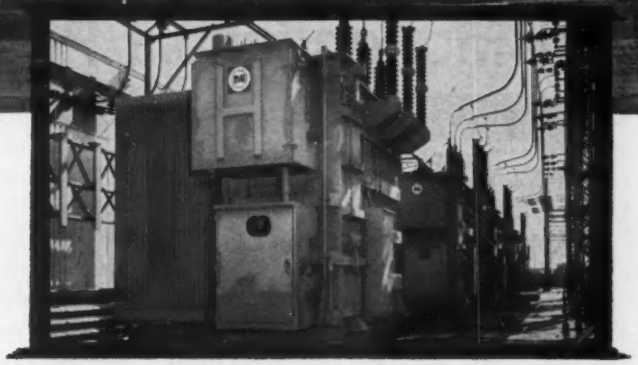
BETTER THINGS FOR BETTER LIVING ... THROUGH CHEMISTRY

The City of Houston has experienced a steady upsurge in population for years. This thriving and expanding city now ranks 7th in population in the nation.

One of the many reasons for this remarkable growth is the dependable and excellent power service supplied by the Houston Lighting and Power Company.

The view below shows the building activity now in progress in downtown Houston. It also shows a substation that is equipped with six 25,000 KVA LTC Moloney Transformers. Moloney Electric takes great pride in its selection to contribute to the expanding power needs of bustling, growing Houston . . . A model example for urban and industrial expansion everywhere.

POWER FOR HOUSTON



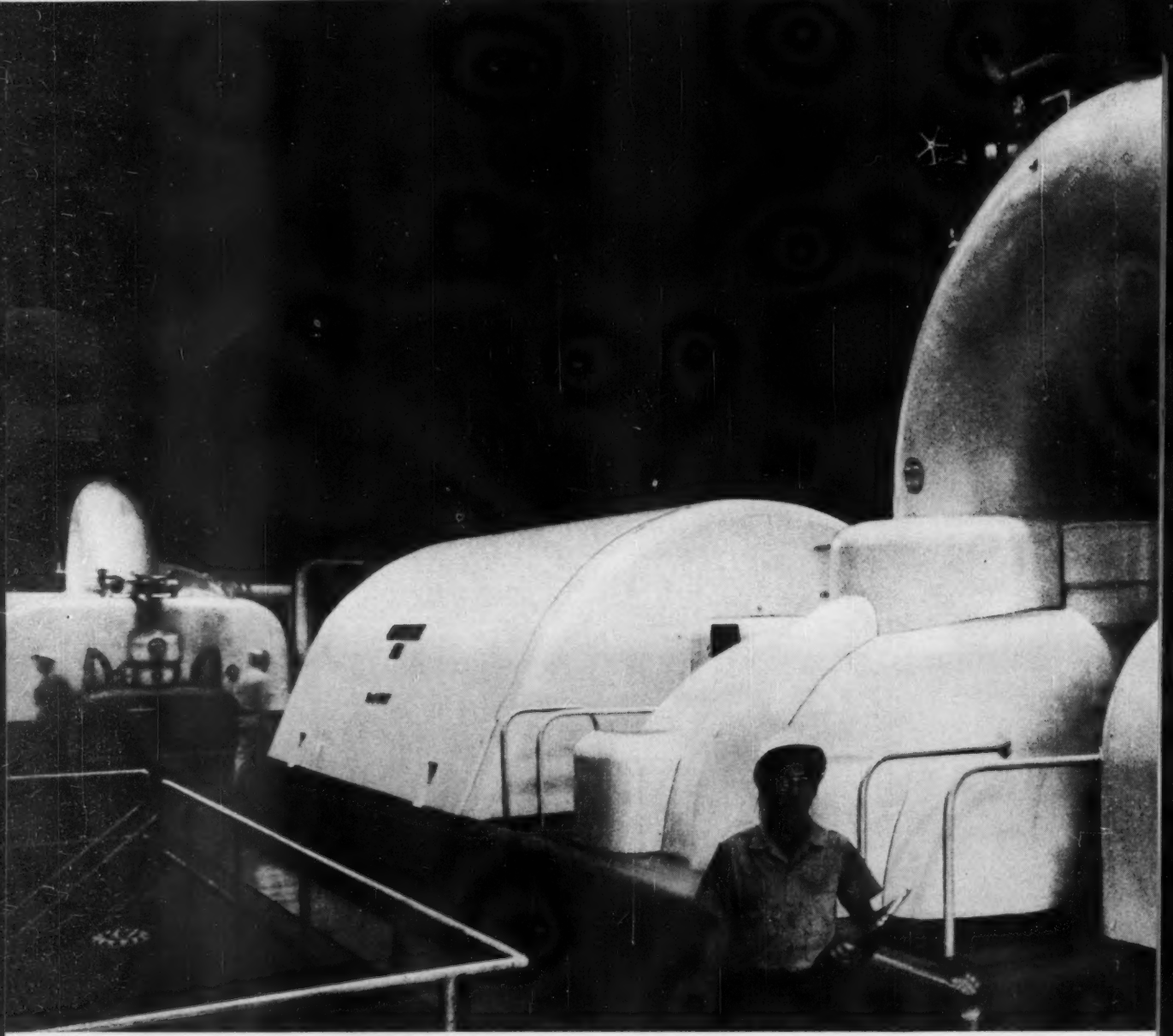
Closeup of Downtown Substation showing six 25,000 KVA, Moloney LTC Transformers.

MEG1-5

MOLONEY ELECTRIC COMPANY

MANUFACTURERS OF TRANSFORMERS FOR UTILITIES, INDUSTRY AND ELECTRONIC APPLICATIONS

FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CAN. • SALES OFFICES IN ALL PRINCIPAL CITIES



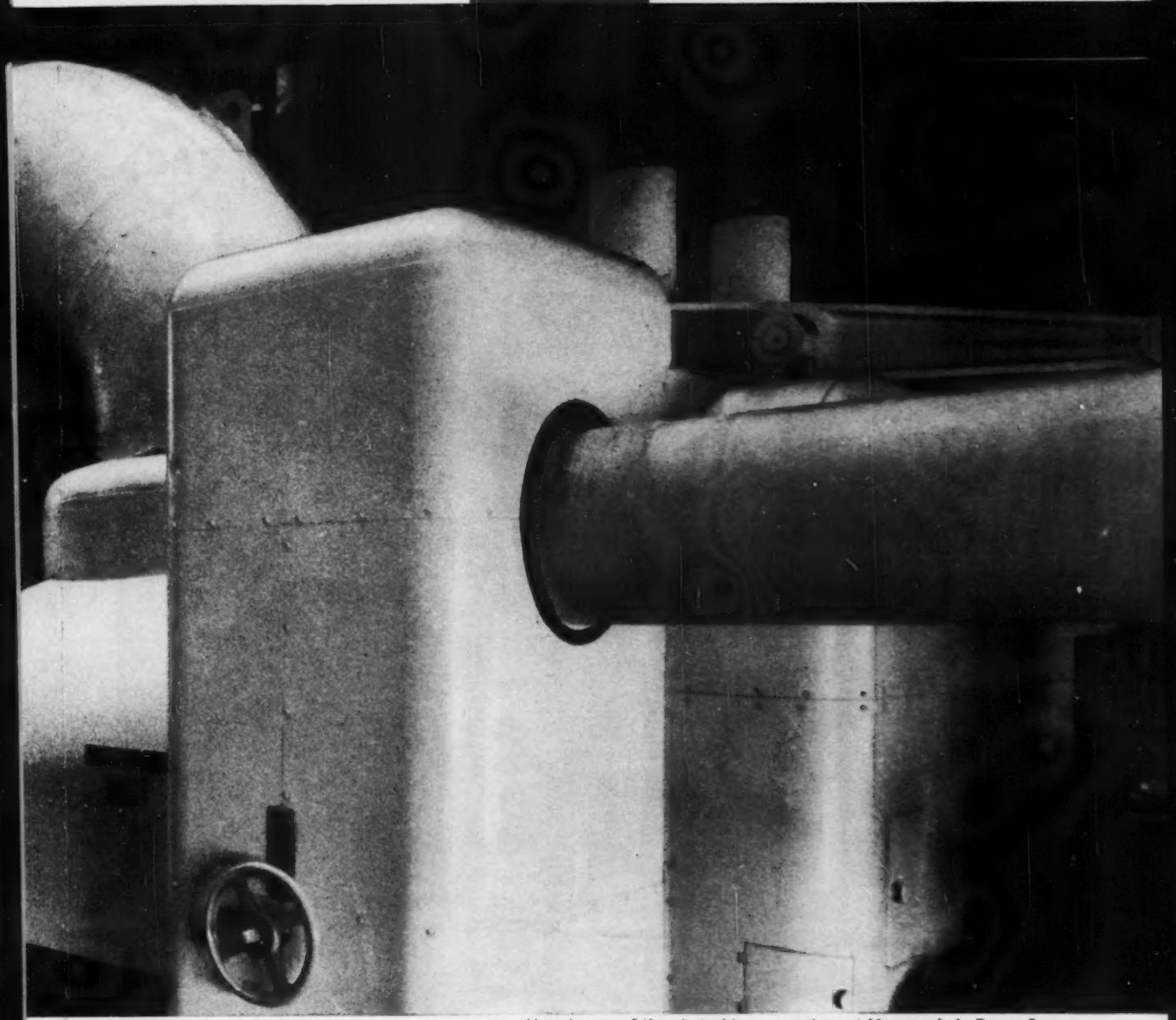
Gulfcrest® oil still on the job after thirty at Monongahela Power Company...

Thirty years ago, turbines at the Monongahela Power Company's Rivesville, W.Va., station were charged with Gulfcrest oil. For twenty-two of those thirty years, Walter W. Stahl, the plant's Chief Chemist has had an opportunity to carefully check the oil's performance.

Since the original turbines were put into operation, a lot of changes have taken place. The plant's power capacity has increased four-fold. New equipment, with higher speeds and greater output has introduced more critical lubrication requirements.

However, one thing hasn't changed much. That's the original turbine oil charge placed in a GE 25,000 kw steam turbine. This turbine generator was placed in operation one year before Mr. Stahl arrived at Rivesville. Now, twenty-three years later, the oil is remarkably close to its original specifications. Here's how the oil tested in 1960. Steam emulsion number, 230; Neutralization value, 0.03; Interfacial tension (dynes per cm at 77°F.), 31.5.

Because of this remarkable performance, this plant has used only one brand of turbine oil for thirty years—Gulfcrest. Mr. Stahl adds, "There has never been a bearing failure in any of the turbine



Here is one of the six turbine generators at Monongahela Power Company's Rivesville, W.Va., station. It's a 90,000 kw steam turbine. This station has used one brand of turbine oil exclusively for 30 years.

years' service
GULF MAKES THINGS RUN BETTER!

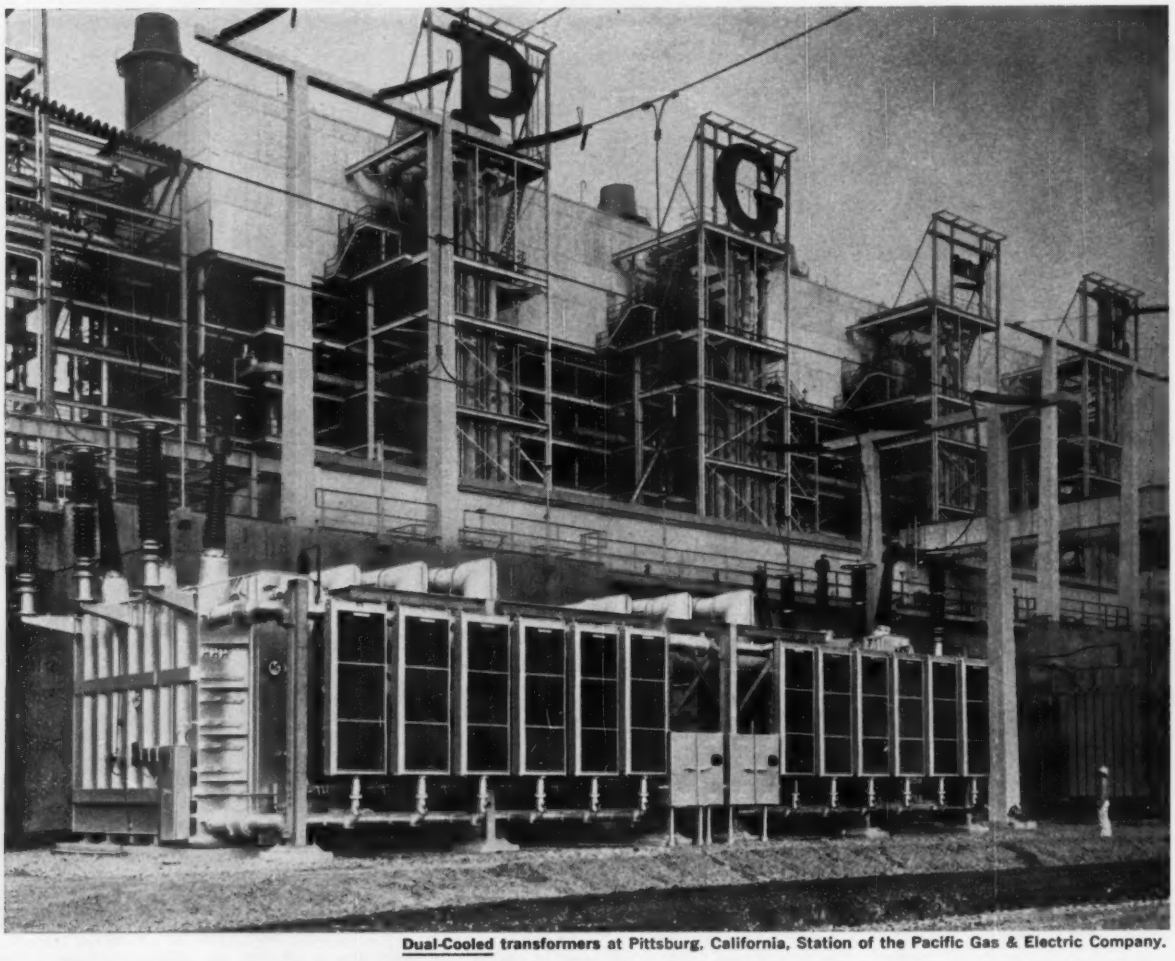
generators due to faulty lubrication."

See for yourself how Gulf makes things run better! Call your nearest Gulf office or, write us for informative booklet on Gulfcrest oil.

GULF OIL CORPORATION
Dept. DM, Gulf Building, Houston 2, Texas

H. E. Schinkle, Gulf Sales Engineer (left), watches as Chief Chemist Stahl takes a sample of oil from the reservoir of a turbine lubrication system. Constant analysis proves Gulfcrest remains remarkably stable.

ALLIS-CHALMERS



Dual-Cooled transformers at Pittsburg, California, Station of the Pacific Gas & Electric Company.

Hidden transformer capacity uncovered!

Dual-Cooled* transformers boost emergency capacity 33% without loss of life

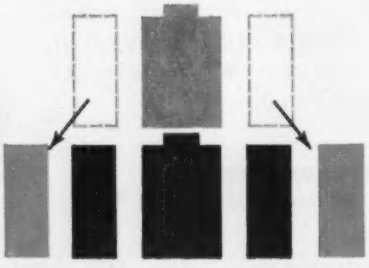
Dual-Cooled transformers — an A-C development — are utilized at this central station to permit two-thirds of the turbine output to be carried in the event one transformer is off the line. In an emergency, cooling equipment from both units is connected to the functioning transformer. Result: Capacity of either unit with dual-cooling is increased one-third over its normal rating.

For substations under gradual load growth conditions, the *Dual-Cooled* transformer capacity bonus can defer purchase of additional units. Smaller transformers can be installed without paying for little-used standby capacity. You save on installation costs, on real estate, fencing, concrete and taxes.

Dual-Cooled transformers are available in any rating from 20,000 kva up. Contact your conveniently located A-C office or write **Allis-Chalmers,** Power Equipment Division, Milwaukee 1, Wisconsin.

A-1426

*Dual-Cooled is an Allis-Chalmers trademark



Another method of dual-cooling is the physical transfer of coolers from one transformer to the other.

FEBRUARY 20, 1961

The Individuals and the Antitrust Cases

Two weeks ago today seven businessmen were sentenced to 30-day jail terms. Twenty-three others drew suspended sentences and five-year probation. All these, and fifteen more, were fined.

Thus was justice, in full public view, meted to the individual defendants in the electrical equipment antitrust cases. Thus have these men become the latest public symbols of a cynical disregard for ethical principles which courses too frequently through business—and government as well.

The time is here for this particular industry to clean its house. If it does not, the ordeals undergone by these unhappy men will have been suffered completely in vain.

Let no one underestimate the severity of the sentences. Careers and personal lives may have been wrecked in some cases. Though no civil rights have been lost (these were misdemeanors, not felonies), private and public opinion and prejudice can have the effect of denying to the men and their families many of the normal comforts of society.

In the eyes of the public, what wrong did they do?

In the narrowest sense, it was to conspire to restrain trade by collusion to fix prices, and in some cases to rig bids and allocate business.

In a broader sense, it was to help perpetuate a pattern of cynical action which has startled the nation in recent years by its spread and depth. Mink coats and deep freezes, influence peddling and TV quiz rigging, government graft at all levels, labor union racketeering, conflict of interest in business and state affairs, and stock swindles—all these have struck at the heart of American morality. To this partial list has been added price manipulation in an industry which serves public utilities.

It matters little to the public that the antitrust defendants, in distinction to those involved in other scandals, gained little personally from the activities for which they are being punished. And it makes little difference to the public that all companies in the industry did not participate in equal measure, and some did not participate at all. The industry—and its people—have been tarred with the same public brush.

The plight of many of the individuals is ironic indeed. Perhaps their greatest error was lack of courage to refuse to conform to what clearly was a "way of life." Without question, they are "taking the rap" for their top managements, for business in general, and, to a degree, for that same public which accepts general knowledge of shady situations without complaint until the dramatic details are unraveled before it.

Corporate managements which deny knowledge of such broad wrong-doing within their corporations simultaneously affirm their inability to manage properly, virtually by definition.

A business community which winks at a low level of ethics is setting the stage for political trouble which could culminate in loss of many of its treasured freedoms.

And an American public which shrugs complacently at slyness weakens itself preceptibly for any struggle against foreign ideologies.

The upgrading of ethics in the electrical equipment industry—and in all business and government—is badly needed.

If it follows, the public examples made of these individuals will be, in a measure, worthwhile.

If it does not, justice will be mocked indeed.

Congress Starts Consideration

Forthcoming Presidential budget recommendations for 1962 will show the extent of Administration's interest in projects

A general pattern of legislation is emerging on Capitol Hill for the Kennedy Administration's drive for power-related legislation. Many of the major bills to be considered by Congress this year still are being drafted; the organization of many committees and subcommittees—mostly in the House of Representatives—still hasn't been completed.

But even this early, the pattern presages a drive for: **(1)** Federal, regional and inter-regional transmission lines and regional power pools, **(2)** New construction starts for federal multipurpose projects, **(3)** A number of national and regional studies into power planning needs—with creation of their attendant commissioners and agencies.

One clue to the coming legislative drive comes from President Kennedy's economic message to Congress, Feb. 2: "Essential to economic growth are long-range energy resource development and accelerated programs for economical production of energy from nuclear sources, including nuclear fusion. We must begin now also to plan for regional cooperative pooling of electrical power. Both efficiency and growth will be served if we interconnect our hydroelectric and thermal power resource plants."

Many power-related bills have been introduced in Congress (EW, Jan. 16, p 41), but most of these are repeats or re-hashes of measures introduced in previous years. Watch for a good block of these "perennials" to win approval in the next two years.

First power-related bills to be spotlighted in the Congressional arena probably will be these:

- "Depressed Areas" legislation, calling for federal aid to economically depressed areas, particularly in the Appalachian Mountains in Pennsylvania, West Virginia, Ohio and Kentucky. One of the possible developments in this legislation would be a federal public works construction program, including generating plants. A power generating program for this area could include coal-fueled thermal plants, as well as hydro plants.

Senate majority leader Mike Mansfield (D-Mont.) has indicated an early Senate vote on a depressed areas bill, although the Kennedy Administration's bill (S-1) is still in the Senate Banking & Currency Committee.

- The Senate has passed a bill (S-153) to authorize President Kennedy to reorganize the organization and functions of federal agencies without specific approval from Congress. Under this bill—similar to the old Government Reorganization Act which expired in 1959—a reorganization plan would go into effect unless one of the two houses of Congress rejected the plan in total, by a majority vote.

This bill, if approved by the House of Representatives and signed by President Kennedy, will be the vehicle for carrying out many of the reforms recommended by James Landis (EW, Jan. 2, p 26).

- A definite block of legislation will be introduced in the next few weeks by chairmen of the Senate Interior, Public Works, Commerce and Agriculture committees to implement the broad recommendations of the Kerr Committee's new report on the nation's water development needs through the year 2000.

The report was general, but the committee majority has agreed privately to a list of specific legislation to implement the broad report—the report will be used as a bipartisan document to spearhead individual water-development bills. Chairmen of the four Senate committees will introduce these bills that their committees will have to consider and act upon.

Anderson Gains New Influence

Only one new face will come to the important (to power) committee chairmanships—Sen Clinton Anderson (D-N. M.) succeeds James Murray (D-Mont.) as chairman of the Senate Interior Committee. Anderson also will be chairman of the committee's irrigation and reclamation subcommittee, where power-related legislation originates.

On the House side of Capitol Hill, Rep Gordon Scherer (R-Ohio) will become ranking minority member of the House Public Works Committee, replacing James C. Auchincloss (R-N. J.) who resigned. The House Ways & Means Committee will have a new minority leader, Rep Noah Mason (R-Ill.) who replaces the late Richard Simpson (R-Pa.).

In the Senate, the Appropriations

MAGNUSON KERR HAYDEN METCALF CANNON BUCKLEY

# of Power and Resources Measures

Committee again will be headed by Sen Carl Hayden (D-Ariz.) with Sen Styles Bridges (R-N. H.) as ranking minority member. The Senate Banking & Currency Committee will stay in the conservative hands of Sen Willis Robertson (D-Va.), with Sen Homer Capehart (R-Ind.) as top GOP member. This committee is considering the depressed areas bill. Sen Warren Magnuson (D-Wash.) remains as the chairman of the Senate Commerce Committee—where the Administration's Federal Power Commission nominees must be approved. Sen Andrew Schoeppel (R-Kan.) is still ranking minority member. And long-time Sen Dennis Chavez (D-N. M.) will continue as chairman of the potent Senate Public Work Committee; Sen Francis Case (R-S. D.) is ranking GOP member.

Aspinall Retains Chairmanship

In the House of Representatives, the important Interior Committee stays in the hands of Rep Wayne Aspinall (D-Colo.) with Rep John Saylor (R-Pa.) continuing as top minority member. The House Appropriations Committee remains in the iron-fisted control of Rep Clarence Cannon (D-Mo.) with Rep John Taber (R-N. Y.) as minority leader. Other important House committee chairmen are as follows (minority members in parenthesis): Commerce, Rep Oren Harris (D-Ark.) (Rep John Bennett, R-Mich.); Public Works, Rep Charles Buckley (R-N. Y.), (Rep Gordon Scherer, R-Ohio); Ways & Means, Rep Wilbur Mills (D-Ark.), (Rep Noah Mason, R-Ill.); Banking & Currency, Rep Brent Spence (D-Tenn.), (Rep Clarence Kilburn, R-N. Y.); Government Operations, Rep William Dawson (D-Ill.), (Rep Clare Hoffman, R-Mich.).

Not Much Change in Congress

Most of the Congressional committees retain about the same political "tone" as their predecessors. Senators and Representatives named to replace former committee members, as a rule, have been chosen on the same geographical or philosophical basis as their predecessors. An example is the Senate Interior Committee. Former Chairman Murray was replaced by Sen Lee Metcalf, a Democratic freshman from Murray's state of Montana; former member Joseph O'Mahoney (D-Wyo.) was replaced by new Sen Joe Hickey (who resigned recently as Democratic governor of Wyoming); the late Sen Richard Neuberger (D-Ore.) was replaced by another westerner, Sen Quentin Burdick (D-N. D.); former member Thomas Martin (R-Iowa) was replaced by freshman Sen Jack Miller (R-Iowa).

An exception to this, of course, was the recent House vote to expand the House Rules Committee by three members, specifically to place more liberal members on the committee.

Sen Magnuson's Commerce Committee has before it: (S-323) to prevent FPC licensing of any dam across the Salmon River (such as Nez Perce) that would cause damage to migratory fish.

The Senate Government Operations Committee, headed by Sen John McClellan (D-Ark.), has before it: (S-195) to distinguish between "capital investment" and "routine expenditures" in the federal budget; (S-529) to permit President Kennedy to make bulk reorganizations of the federal government with only an "all or nothing" veto by Congress (EW, Jan. 30, p 26-27).

The House Public Works Committee, headed by Rep Buckley, has before it the perennial bill (HR-8) of Rep James Trimble (D-Ark.) of broadening federal multipurpose project allocations to lower the amount charged to power facilities.

Rep Harris' House Commerce Committee has before it: (HR-14) to provide disclosure of *ex parte* contacts at federal regulatory agencies, such as the FPC and SEC, (HR-3524) to provide for "comprehensive development" of the nation's river basins.

Depressed Areas Get Attention

Depressed areas legislation on the House side (HR-361 and HR-1084) is awaiting consideration by the House Banking & Currency Committee. This will get swift action, under pressure from the White House.

The House Ways & Means Committee has (HR-45), the "Boggs Bill" to permit tax-exempt contributions to certain organizations and unions involved in political activities. And (HR-2802) to require disclosure of corporate officials' and controlling stockholders' income and compensations.

And the House Merchant Marine & Fisheries Committee has before it a bill (HR-2722) to authorize a study by the Interior Department of migratory fish conservation problems in reservoirs.

SAYLOR HARRIS ANDERSON CHAVEZ ASPINALL SCHERER

Norman Clapp Appointed REA Administrator; A.J. Wagner to TVA Board

NORMAN CLAPP

Norman Clapp, the newly-appointed rural electrification administrator, is a firm advocate of continuing federal policies that he learned as a younger brother of Gordon Clapp, former chairman of the Tennessee Valley Authority.

Norman Clapp was an assistant to former Sen Robert M. LaFollette (R-Wis.) for nine years in Washington. He was active in the creation and development of REA in its early days. Since then, he has taken an interest in Wisconsin co-ops. His wife presently edits the Grant Electric Cooperative's (Lancaster, Wis.) publication.

The new REA administrator won his appointment over a list of some ten other candidates. His primary backer is Sen Hubert Humphrey (D-Minn.). Sen William Proxmire (D-Wis.) also backed him for the job.

Clapp, 47, was defeated twice as a Democratic candidate for the House of Representatives from the Third District in Wisconsin. Last November he was beaten by Rep Vernon Thomson, a Republican.

His confirmation by the Senate Agriculture Committee seems assured. He will take over the REA reins from Acting Administrator John Baker—agricultural credit services director. Former REA Administrator David Hamil has returned to his ranch in Colorado after resigning Feb. 3.

None of Clapp's assistants—one deputy, one assistant for electricity, one assistant for telephones—has been appointed yet.

Ralph Foreman, deputy administrator under Hamil, has taken the post of general manager for the Nebraska Electric Generation & Transmission Cooperative, Inc, Columbus, Neb., effective April 1. He will leave his REA post this month. The Nebraska system operates a 126-mile, 230-kv transmission line, connecting its 27 member co-ops and 88,000 customers with the Bureau of Reclamation's system at Fort Randall Dam, S. D.

Career Engineer Is TVA Director

Also appointed by President Kennedy last week was a new director for the Tennessee Valley Authority—TVA's own general manager, Aubrey J. Wagner. Wagner, an engineer, will replace former Rep Brooks Hays (D-Ark.) who was selected by the President to be Assistant Secretary of State for Congressional affairs.

Wagner's term will run to 1969, almost the full nine-year term to which Hays had been appointed last year. TVA Chairman Herbert Vogel holds office until 1963; the other TVA director, Arnold Jones will serve until 1966.

Wagner came to TVA in 1934 as an engineer directly from college. He was named general manager in 1954. He calls himself a political independent.

SEC Ruling Is Guide for Stock Options

The Securities & Exchange Commission has approved an application by Middle South Utilities, Inc, to initiate a stock option plan for its executives. It was the first time the SEC has made a formal ruling on utility stock options, and the opinion by out-going Chairman Edward N. Gadsby gives definitions applicable by other utilities.

Until now, utilities regulated by the Public Utility Holding Company Act of 1935 have hesitated to apply to the SEC for permission to set up stock option plans because it has always been assumed that the Act prohibited them. Chairman Gadsby, however, agreed with Middle South that stock options have become an important tool in recruiting executive talent and he observed, "We are convinced that adequate and fitting executive compensation is a requisite for the financial and operational health of a utility."

Gadsby said the Commission gave "considerable weight" to testimony by Middle South which showed that executives are becoming more and more attracted to jobs where stock options are available, and companies without them are having increasing difficulty in obtaining new management talent. Gadsby noted in his opinion that of the 32 officers in the system, only three have been employed in the last 25 years and four are already over retirement age.

Middle South's plan, which must still be approved by its shareholders, would set aside 120,000 shares—compared with 16,750,000 presently outstanding shares—for sale to officials of the parent company and its subsidiaries over the next five years. The SEC ruled that sale price should be at 100% of the market value on the date of issue, instead of 95% as Middle South had requested. SEC also said that not more than 25% of the shares should be optioned to executives employed by Middle South or subsidiary companies at the time of the plan's adoption, and limited the purchase price of shares brought by any one executive to 150% of his regular annual salary.

Udall Echoes Ickes Power Program

Interior Secretary Stewart Udall pulled the curtains open a little further last week on the Kennedy Administration's power policies—and he revealed a clearer emphasis on federal power development. First he put out a formal statement on power policy for all Department personnel.

Then, in a press conference, Udall said he planned to emphasize federal power, but, "there is no doctrinaire note, no hostile note with regard to private power. We look forward to some cooperation." He added, "We don't oppose state development, nor do we oppose some cooperation" with private power but, he said, "we're not running out searching for ways to let private industry have access to major hydroelectric sites."

Udall also released his own five-point power program for the Department, based on an earlier five-point program, drawn up in 1946 by former Interior Secretary Harold Ickes.

Significant among Udall's plans is the construction of regional, major federal power transmission lines, including interties between Bonneville Power Administration and the federal Central Valley Project, Calif.; between Bonneville and the Missouri Basin Project; between the Upper Colorado River Project and the Missouri Basin.

Udall had this to say about whether he is thinking presently of a nation-wide federal transmission system: "I wouldn't say so at this time. We're moving very gingerly on this. One tentative conclusion we've reached is that such interconnections might be handled on a common-carrier basis to the benefit of both public and private power."

Congressional observers feel that Udall may recommend construction of one or more federal inter-regional transmission lines (in the neighborhood of 500 kv) within the next year or two. Which ones, they aren't prepared to say, but the three mentioned above are most likely.

A number of new power-related federal construction starts for the Bureau of Reclamation this year is probable. Udall is expected to list them in a week or so in a new group of budget recommendations to the Congress. The federal Burns Creek Project, Ida., and Fryingpan-Arkansas Project will be among them.

Initial reaction from Congressional leaders indicates that Udall's views still are too general for comment—he would have to give them specific legislation before they would express themselves. One eastern Republican Congressman, however, said, "It certainly isn't what I'd call a private power program."

Gen. Mgr. Alex Radin of the American Public Power Assn called the "tone" of Udall's recommendations excellent; he thinks the Udall program is "dynamic" and "forward looking." Radin also feels that Udall's views are still fairly general.

One reason advanced for the generalities in the Udall statement is that the new Secretary is reviewing a number of marketing programs for different federal power projects—the Upper Colorado and Upper Missouri Basin projects in particular—and he wants only a broad statement of principle until he can come up with specific recommendations for each project.

"He's giving notice," said another Congressional observer, "that he wants the Department's power contracts to favor preference customers, not private companies." In particular, this observer said he was referring to Department plans for allocating power from the Bureau of Reclamation's Big Bend Dam on the Missouri River, S. D. Big Bend will have an installed capacity of 468 Mw on the line by 1966, and 66% of the power is designed for peaking purposes.

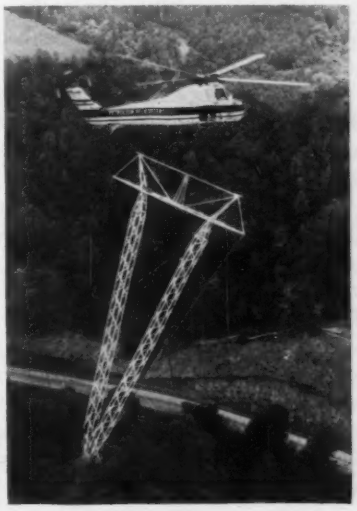
Other observers feel that Udall is serving notice that he simply plans to "ignore" power companies in his power planning—that investor-owned systems will come into the federal power picture only in limited cases. This is a complete reversal of the "partnership" policy

(*Continued on page* 30)

AEP to Use Guyed V Transmission Towers

The first use of guyed V aluminum towers in the US for an operating transmission line has been announced by American Electric Power System. Towers of this design, similar to those used in Canada and Scandinavia, will be used for four 138-kv lines, totalling 100 miles. Two of the lines will run from Appalachian Electric Power's Smith Mountain hydro project, located 46 miles south of Roanoke, Va. The other two will begin at Kentucky Power Co's Big Sandy Plant near Louisa, Ky. Delivery on the towers, which use a design developed by Aluminum Co of Canada for one of its own 345-kv lines, is scheduled to begin about Aug. 15.

The tower is a V structure with a single compression foundation and four anchors. Tower heights vary from 50 to 100 ft; weights, from ¾ to two tons. Transmission circuit will be a two-conductor bundle design, with single-circuit construction. The towers will use approximately 800,000 lb of structural aluminum.



Udall Echoes Ickes on Power Program (*Continued from page* 29)

of the Eisenhower Administration.

"Under Eisenhower, public power was regarded as a necessary evil," said Udall. "We regard it as a necessary good. We approach public power with a positive attitude." Federal dams and power generation would be planned for "maximum effectiveness," he added.

Udall again referred to the current power development at Hells Canyon, on the Snake River, by Idaho Power Co, pointing out that this was the result of a policy of the Eisenhower Administration which he wants to get away from. He added that he may yet intervene, before the Federal Power Commission, in the present license hearings between rival Nez Perce and High Mountain Sheep projects, on the Middle Snake River. (Earlier, Udall had asked for return of power estimates made by his predecessor, Fred Seaton.)

Many of the phrases in the Udall policies are similar to those in a special report on natural resources, prepared by a Congressional group headed by Rep Frank Smith (D.-Miss.), released shortly after the Kennedy Administration came to office. Congressional leaders feel there's "nothing new" in the Udall policies; that they're merely repetitions of the earlier Democratic statements on natural resources.

Udall's recommendation for "cooperative pooling of generation and transmission facilities" gives added support to plans of the Mid-West Electric Consumers Assn—in the Eastern Division of the Missouri River Basin Project—which envisions federal transmission lines plus municipal and co-op thermal plants to back up federal hydro plants on the Missouri River. Both R. W. Beck & Associates and the Kuljian Corp reportedly are working on designs and plans for lignite-fueled steam plants for the Mid-West group. Assistant Interior Secretary Kenneth Holum formerly was general manager of this group.

Udall reportedly is aiming at a return to former Interior policies which emphasized power generation over irrigation—that Udall won't try to "subsidize" irrigation projects from power revenue. On other multi-purpose uses, Udall told the press conference that he and Under Secretary James Carr are "taking a hard look" at flood control benefits for California.

Udall also said he is still discussing the future of Bonneville Power Administration. Some Congressional sources speculate that this would call for expanding Bonneville to give it authority to build thermal plants.

As to atomic generation, Udall commented, "That is a basic decision for the Administration and Congress. We won't have the entire say, but we hope to have some say. This awaits basic decisions."

Dateline . . . Portland, Ore. (*Continued from page* 5)

missioner, Morgan found enough time away from an involved transportation problem to raise hackles in electric utility offices several times.

None of his past opponents, either in politics or in utilities, deny his competency.

Talking of his appointment to the FPC, Morgan said:

"I believe that the primary objective of this job, exactly as that of the public utility commissioner of Oregon, is to see that the public is not damaged by the great corporations which operate most efficiently as a monopoly.

"I think a regulatory commission should assure that corporations behave as they would be forced to behave in active competition with each other for the public's favor."

"As a legislator, Democratic state chairman, and Oregon Public Utilities Commissioner, Mr Morgan sometimes left the impression that he was conducting a political crusade against private enterprise," The *Oregonian* commented following his appointment. "Most who know him well give him credit for sincerity. It seems to be his nature, however, not to credit the sincerity of his opponents. He had made enemies not only by attacking what he believed to be wrong, but in the way he did it. He has a knack for insulting people."

Morgan favored federal construction of a Hells Canyon Dam over the three dam series FPC licensed to Idaho Power Co. He was not an active drumbeater on that front and can't recall now whether he ever contributed as much as a $2 membership to the National Hells Canyon Assn.

But Morgan told *Electrical World* from his 600-acre ranch on the eastern slope of the Cascade Mountains that he has an open mind on the Nez Perce-High Mountain Sheep controversy.

Declining to be tagged either pro-public power or pro-investor-owned power, Morgan said, "I'm simply going to have to reach conclusions on the basis of transcripts of evidence. I don't think it either wise or appropriate to be making any sweeping statements regarding any predilections. As I did as Oregon public utilities commissioner, I will simply follow the record."

On comprehensive stream development, Morgan told *Electrical World*: "I've always felt that a major river should be developed as fully and for as many mutually compatible uses as possible. There are many suggestions that minor rivers should be reserved for fish hatching and spawning, but the big ones should be developed to the maximum, and without projects that don't utilize their maximum capacity."

Run Units or Shut Down?

Economics of shutting down generators during off-peak periods is simply and easily determined

K. M. DALE, Engineer, Generation Section, Electric Utility Engineering Dept, Westinghouse Electric Corp, East Pittsburgh, Pa.

When the load on a utility system decreases at the end of the day, should units that are no longer required to meet load and spinning reserve needs be kept running, or should they be shut down and restarted at the beginning of the next day? Are the extra maintenance costs incurred by more frequent starting and stopping completely outweighed by the savings that can be obtained by shutting down inefficient units during off-peak periods?

A simple method for figuring the economics of shutting down generating units during off-peak periods is described here. It involves only the cost-output curves and the startup fuel costs of each unit. Accurate results are provided if the division of the total system load between the running units can be assumed. However, because this assumption is difficult to make when there is a large number of generating units on a system, the method is more useful to the smaller utility.

Consider a small utility having the daily load cycle of Fig 1. Nearly all generating units must be run between 8 am and 9 pm, but the plant engineer must decide whether he should shut down any units between 9 pm and 8 am on weekdays. If he shuts down a unit, its load will have to be carried by the remaining units. Although shutdown of a unit usually reduces fuel cost, this is not always the case. In fact, the change in fuel cost is dependent on the load and the relative efficiencies of the unit shut down compared to the units kept running.

If a unit is shut down at 9 pm it will have to be started up in time for the 8 am load on the following day. The cost of fuel required to start up a unit after a given period of shutdown can be measured, but it is more difficult to evaluate the additional maintenance cost due to this procedure. Clearly if this latter cost is large, it would not pay to shut down a unit for short periods. However, this method excludes this unknown startup maintenance cost from the economic comparison. The plant engineer's estimate of the startup maintenance cost of the units concerned may then be compared to a calculated saving before finally deciding on a course of action.

Because of the mass of calculations required to determine the savings by shutting down units on a large or medium-size utility, it is recommended that advantage be taken of the computer programs available to the industry. These programs employ incremental cost curves to determine the optimum economic dispatch among the generators running on different parts of the system, allowing for transmission losses with penalty factors. However the smaller utility does not have a problem in deciding what part of the total system load each unit should carry in any given hour. For these small utilities, this method will provide a sufficiently accurate result.

Production Costs Are Required

A cost-output curve, required for each unit in dollars per hr versus net generation in kw, can be developed as follows:

1. Obtain the latest performance or manufacturer's design data of Btu-per-hr input to the boiler versus kw net output.

2. Convert this curve to a dollars per hr versus kw curve using average fuel cost. Extend the curve to cut the zero net generation line, giving the no-load fuel cost.

3. Modify the curve to include the cost of maintenance due to spinning and incremental loading of the unit. The total annual maintenance and operating cost can be considered to consist of three components: **a,** an annual cost, independent of unit performance, such as cost of labor, etc.; **b,** a cost proportional to the number of hours the unit ran in the year. This is the cost of maintenance due to spinning the unit, and its average hourly value should be added to the fuel cost versus load curve; **c,** a cost proportional to the kwhrs generated by the unit during the year. This is the maintenance cost due to incremental loading and is usually expressed in mills per kwhr. It will increase from zero at no load to a maximum at full load. Added to the fuel plus spinning maintenance cost curve, it will produce the final cost-output curve.

Since this curve is basic to the method, a numerical example is developed for one unit, Fig 2. The left ordinate gives the input in Btu per hr which is then converted into dollars per hr at a fuel cost of 30¢

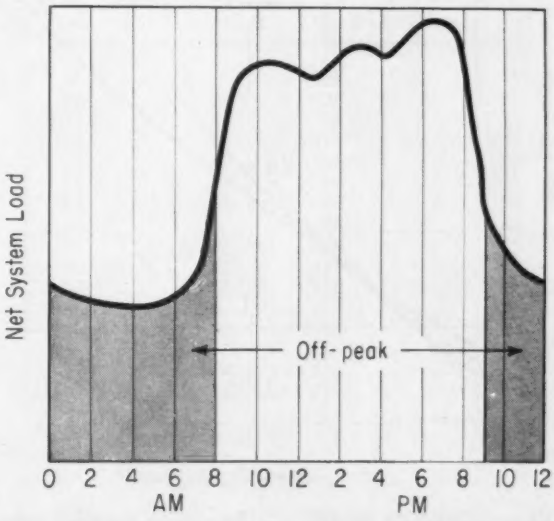


FIG 1—DAILY LOAD CYCLE requires fewer units during off-peak hours and poses problem of which units to shut down

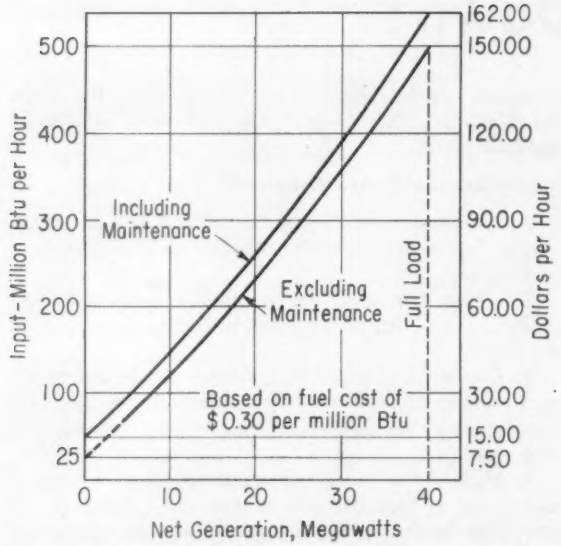


FIG 2—OUTPUT COST CURVES use latest performance data and average fuel cost; maintenance due to spinning and incremental loading of units is included in the upper curve

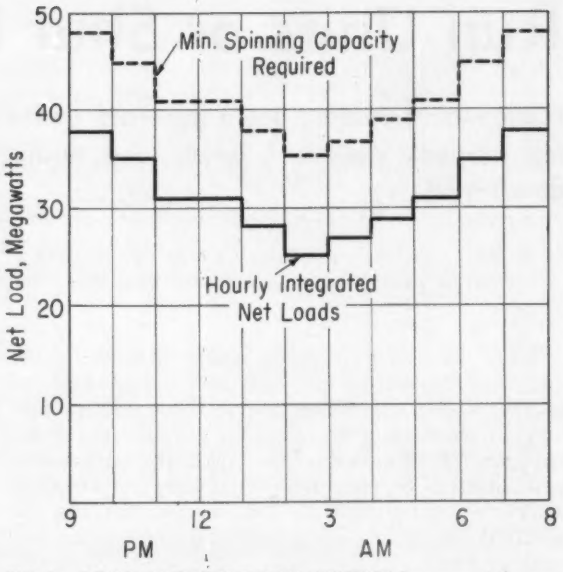


FIG 3—LOAD AND SPINNING RESERVE for overnight period are substantially below system capacity of 70 Mw and present alternative methods for operating units overnight

per million Btu for the right ordinate. The extension of the curve to no load produces a cost of $7.50 per hr while the full load cost is $150.00 per hr. The final curve is developed by adding spinning maintenance and incremental loading maintenance. If spinning maintenance is $8.00 per hr and incremental maintenance is 0.1 mills per kwhr, final cost-output curve will be above the original curve by $8.00 at no load to $12.00 at a load of 40 Mw. The $12.00 is calculated by taking the spinning cost of $8.00 and adding to it the incremental cost of $(0.1x40).

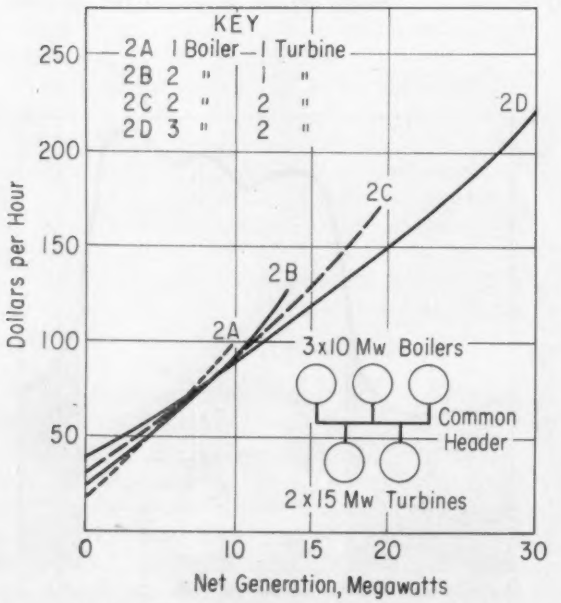


FIG 4—COMMON HEADER SYSTEM can be operated with various combinations of boilers and turbines. Each combination has its own cost output curve and ultimate rating

Startup Costs Are Required

Only the startup costs for the boilers and turbines for a given length of shutdown are required in this method. It is not necessary to determine the relationship between boiler startup costs and hours of shutdown.

The startup of generating units involves two main components—the turbine and the boiler. Since the thermal capacity of the turbine is small, most of the fuel required to start up a turbine is used to overcome mechanical friction and to build up the mechanical spinning energy of the rotors. These turbine startup costs can be assumed to be constant regardless of the time since the turbine was last shut down.

The boiler startup costs should include all fuel costs incurred between shutting down and eventual resynchronizing of the actual generating unit. The boiler startup costs should therefore include the cost of banking the boiler if this procedure is followed during the shutdown period. Clearly, the cost of fuel used during banking will increase for longer shutdown periods. This is still true if the boiler is allowed to cool instead of being banked since the temperature of the boiler will decrease with time following shutdown, resulting in higher boiler startup costs for longer shutdown periods.

Example of Method

This example details the steps in this method for figuring the economics of turbine-generator shutdown. For this case, the generating system consists of: One-40-Mw unit with a cost-output curve of Fig 2 and one common header group of three 10-Mw boilers and two 15-Mw turbines. Fig 4 shows the combinations which

can be run for the common header group and the cost-output curves for each combination. The total system capacity therefore is 70 Mw.

Being interconnected, only 10 Mw of spinning reserve is necessary. Since the highest load between 9 pm and 8 am, shown on Fig 3, is 38 Mw, a decision must be made on running or shutting down units.

Two alternatives to be compared are:

a. Keep all boilers and turbines running continuously

b. Shut down one boiler and one turbine of the common header group at 9 pm and start them up at 8 am.

Startup costs for alternate **(b)** are assumed at $20.00 for turbine startup fuel cost and $22.00 for fuel for banking the boiler over the 11 hour period.

These alternatives are shown in the table. Enter the values of net load and the spinning capacity for each alternate as shown in the table. Knowing the relative efficiencies of the units, their valve point loadings, minimum load ratings and other practical limitations, determine the load each unit should carry in order to meet the system load during that hour. Having done this for both alternates, the hourly cost of running units 1 and 2 at the various loads can be read directly off Fig 2 and 4, respectively.

The sum of the hourly costs of both units gives the production costs over the 11 hr period. Boiler and turbine startup costs must be added to alternative **(b)**. The table shows that the production cost is $89.00 less each weekday if the turbine were shut down, but that this savings would be offset by the unknown cost of startup maintenance. It will be up to the plant engineer to decide whether the additional maintenance due to starting up a boiler or turbine will overcome the fuel savings due to shutting down units.

If desired each period can be further subdivided and the number of units to run can be changed. Essentially the greatest difficulty lies in deciding the optimum way to divide the system load between the spinning units. This difficulty increases with the number of units and to obtain a more accurate result it may be necessary to use incremental cost curves to determine the loading on each unit during each hr, or to use average heat rates curves as described in a recent paper.

Value of Excess Spinning Reserve

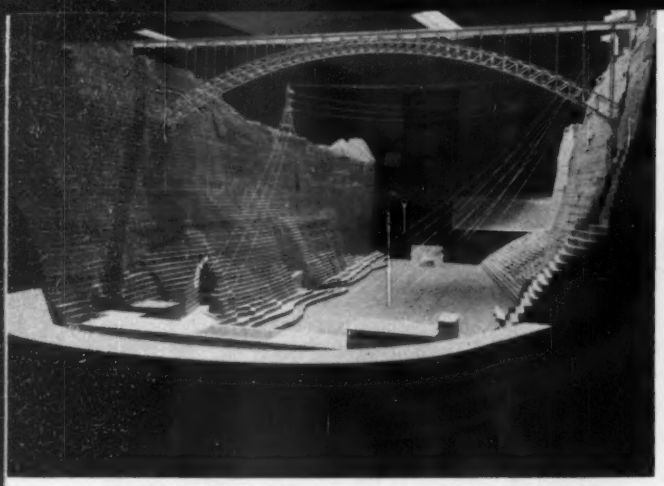
It should be noted that the spinning reserve will be 15 Mw greater if the unit is kept running. Since it is often expensive to carry spinning reserve, one may feel that some credit should be given for the excess spinning reserve. This credit must recognize the difference in on-peak and off-peak spinning reserve. The former involves running the most inefficient units on the system and is clearly more costly than off-peak spinning reserve. Moreover, the first 10 Mw of spinning reserve are more valuable than the second 10 Mw since the first is more frequently required. The risk of having to buy emergency power from the interconnection is undoubtedly lower if the units were kept running. Is this reduction in risk worth what it is costing? This question can be answered using outage probability calculations which are beyond the scope of this article.

Two Alternatives for Overnight Operation

		ALTERNATIVE (a) Keep units 1 and 2D running 70 Mw spinning capacity				ALTERNATIVE (b) Shut down 1 boiler and 1 turbine of unit 2 50 Mw spinning capacity			
		Unit 1		Unit 2D		Unit 1		Unit 2B	
Hour Commencing	Avg. Net System Load (Mw)	Net Load (Mw)	Cost ($)	Net Load (Mw)	Cost ($)	Net Load (Mw)	Cost ($)	Net Load (Mw)	Cost ($)
9 p.m.	38	32	127	6	67	34	136	4	47
10 p.m.	35	30	119	5	60	32	127	3	42
11 p.m.	31	27	112	4	55	29	114	2	36
12 p.m.	31	27	112	4	55	29	114	2	36
1 a.m.	28	24	94	4	55	26	102	2	36
2 a.m.	25	21	82	4	55	23	90	2	36
3 a.m.	27	23	90	4	55	25	98	2	36
4 a.m.	29	25	98	4	55	27	106	2	36
5 a.m.	31	27	106	4	55	29	114	2	36
6 a.m.	35	30	119	5	60	32	127	3	42
7 a.m.	38	32	127	6	67	34	136	4	47
			1186		639		1264		430

Total Production Cost—Alternative (a) 9 p.m.-8 a.m.	$1825	1 Boiler Start-up Cost	$22.00
Total Production Cost—Alternative (b) 9 p.m.-8 a.m.	$1736	1 Turbine Start-up Cost	20.00
Apparent Saving*	$89		

* Does not allow for start-up maintenance cost.



SPATIAL RELATIONSHIPS are shown by this scale model of Glen Canyon power plant, bridge, transmission lines and towers. Base of Glen Canyon dam is in foreground

GENERATOR AND POWER PLANT MODEL helps designers to visualize engineering construction problems. Complete model includes bridge, switchyard, and the transmission lines

Model Aids Design of Glen Canyon

SAMUEL JUDD, Chief, Structural and Architectural Branch, Bureau of Reclamation, Denver, Colo.

A three-dimensional, scale model of Glen Canyon power plant and its related features is helping US Bureau of Reclamation engineers in designing the power plant and other electrical facilities. One of these involves the difficult position of conductor catenaries up to the towers on the Canyon's rim. Built in the Engineering Laboratories of the Bureau at Denver, the model projects the spatial relationships of major elements of the unit—power plant, switchyard, Glen Canyon bridge and transmission line structures.

Study of the model aids engineering planners in achieving:

- Unity of purpose of the various structures
- Correlation of designs with safety and esthetic considerations
- Improved designs of powerhouse features and transmission line details at the damsite.

The model is built of wood and has a floor space of about 9 x 10 ft. It is 4 ft high and simulates some 2,400 ft of canyon downstream from the toe of the dam. It also delineates the area between the dam and the power plant, the power plant itself, outlet works valves and related structures, the road tunnel portal leading to the powerhouse, tail race, the downstream portals of spillways and flip buckets, Glen Canyon bridge, switchyard area and temporary parking areas.

Topography is contoured using ½-in. plywood, each layer representing 10 ft of the prototype. The only deviation from this contouring is above the right rim where the ground is comparatively flat. Here the area is contoured with ¼-in. plywood representing 5-ft intervals. Two bays of the powerhouse have a transparent roof to reveal two of the generators and the general form of the interior. The bridge is fabricated of brass bar, rod and tube stock and all joints are soldered.

Through the use of the model, numerous studies were made of the layout of the powerhouse and its components and the over-all effect of the positioning of the powerhouse in relationship to the massive canyon walls and to the curved base of the dam. Relative locations of the service bay, control areas, machine shop, elevators, stair tower, cable shaft, and other features all entered consideration.

The final selected design is a powerhouse 648¾ ft long by 104¾ ft wide. The exterior architectural treatment of the power plant—concrete surface, exposed flanges of the structural steel columns, metal window walls—was also confirmed by model use.

The Glen Canyon power plant will house eight hydraulic turbine-generators rated 112,500 kw, 90% power factor, 150 rpm, 60 cps, 13,800 volt. Each generator is to be about 43 ft in diameter and 32 ft high from the base. Present designs call for each pair of generators to be connected to a bank of three single-phase transformers. The banks are to be located on a deck downstream from the generator room.

The high-voltage switchyard for the Glen Canyon powerplant is to be constructed on the west rim of the Colorado River starting 300 ft downstream from the west abutment of the bridge and 400 ft from the canyon edge. The breaker-and-a-half switching arrangement being considered calls for 17 high-voltage circuit breakers of 10,000 Mva each. The yard will cover a minimum area of 310 ft x 1,070 ft.

The conductors of the four high-voltage transformer circuits will originate at take-off brackets on the downstream wall of the powerhouse 44 ft below roof level. Drops from the circuits make the high-voltage connection to the transformers and lightning arresters on the deck below. From the brackets, the conductors will pass under the bridge arch and will rise approximately 750 ft in horizontal spans 900-1,400 ft long to towers 160-200 ft high along the canyon rims. From the rim towers the circuits will be

TRANSMISSION LINE AND BRIDGE CLEARANCE is pointed out for east rim of Canyon. The 1,271-ft bridge is 700 ft above river and 860 ft downstream from dam

Power Features

routed into the switchyard supported on intermediate towers where required.

Partial lightning protection of the circuits will be provided by shielding of bridge and overhead ground wires between the rim towers and the switchyard. The zone between the rim towers and the bridge shielding will be covered by masts mounted on top of the rim towers or by closely paralleling with overhead ground wires on separate structures when feasible.

The model was used to check the planned solution to the difficult space problem of positioning the catenaries of conductors from the powerhouse transformers to the rim towers. The approach was to maintain safe electrical clearances to the bridge arch and canyon walls and rims, by first establishing locations of the four rim towers as close as possible to the sound edges of the canyon consistent with foundation safety, span length limitations, and required phase and circuit spacings. The conductors were then sagged in to maintain the bridge arch and canyon clearances to ground under the conditions of either sideswing from wind acting transversely or the generally accepted elliptical movement in space from possible "galloping." With the conductor catenaries thus vertically positioned, the heights and most efficient outlines of the rim towers were established using a nominal amount of trim along the canyon edge.

A fine-link necklace chain was suspended between the model rim towers to simulate the catenaries of the conductors to the powerhouse take-off brackets, to check all critical electrical clearances, tower heights and configurations, and trim along the canyon rims. Templates representing the maximum sideswing of conductors under transverse wind loading were also used to check critical electrical clearances. For this check to be valid it was necessary that the model be of greater than normal accuracy with respect to topography and positioning of critical structures. Close checks between the model and calculations demonstrated that the effort was worthwhile.

GLEN CANYON DAM AND POWER PLANT

GLEN CANYON UNIT—Glen Canyon dam is the key unit of the Colorado River Storage Project, a multiple-purpose undertaking in the 110,000-sq-mile Upper Colorado River Basin authorized by Congress in 1956. One of four initial storage units, Glen Canyon will be the principal unit storing water to regulate the Colorado River and thereby fulfill compact commitments to the Lower Colorado River Basin. The 28-million-acre-ft reservoir behind the dam will contribute about 75% of the water storage authorized for initial development in the Upper Basin and the powerplant will generate about 75% of the project's total power.

Glen Canyon dam, located 13 river miles below the Utah border in northern Arizona, is the sole project dam to be built on the Colorado River. The 710-ft-high concrete-arch structure will be 1,550 ft long and it will have a volume of 4,865,000 cu yd. Construction started in April 1957 and completion is scheduled for early in 1964.

Glen Canyon bridge, a spectacular rim-to-rim structure, spans the canyon about 860 ft downstream from the dam. The bridge is the highest and second longest steel arch bridge in the United States; its 1,028-ft-long arch is 700 ft above the river. The deck is 1,271 ft long. The bridge was opened to public use in February 1959.

Transmission Towers Anchored

Field tests show gain in loading capability because of special backfill, power tamping and preloading; determine type of anchor to use in muskeg terrain

M. MARKOWSKY, Supervisory Project Design Engineer-Structural, Transmission Dept,

J. I. ADAMS, Soils Engineer, Research Division, The Hydro-Electric Power Commission of Ontario, Toronto, Canada

Recent field tests to study anchorage of transmission towers in muskeg terrain reveal that:

1. Transmission line towers can be anchored in shallow muskeg terrain using vertically installed expansion type anchors. Backfilling with a minimum of 3 ft of power-tamped crushed stone and preloading of each anchor will eliminate creep and provide high capacity anchorage.

2. Inclined anchorage for guyed structures requires additional study to improve the installation technique. This improvement must be mainly concerned with installing the anchor in an inclined hole in such a manner that caving and sloughing is prevented.

3. Soil-cement backfill is not feasible in muskeg terrain due to the difficulty of controlling moisture conditions. Also, the use of a grouted rod technique is not being considered at the present time because of the difficulty of preparing and controlling grouting mixtures in winter.

These were the results of field tests made by the Hydro-Electric Power Commission of Ontario to guide the construction of extra-high-voltage transmission lines for long distances over muskeg terrain in Northern Ontario. Equipment for these tests was designed by R. B. Martin of Hydro's Research Division, who also coordinated the field work. Muskeg is terrain in which a surface accumulation of decayed vegetation or peat supports a living vegetal cover. The type of peat under the proposed transmission lines consists of a wood fibrous material and varies in depth from 2 to 7 ft.

Fortunately, the mineral soil underlying the muskeg along much of the line routes will provide a firm bearing for most tower footings. The main problem is therefore the provision of adequate uplift resistance to prevent towers overturning. The decomposed organic materials of which muskeg is composed, being of little effective weight and uplift resistance, are unsuitable for use as backfill. Conventional soils would require excessive hauling and be too costly.

The first tests of anchors of different types were carried out at Abitibi Canyon. Anchors were installed and pulled vertically and at various angles to the vertical. The screw anchors were installed either by hand or power. The expansion anchors were installed in 12-in. holes drilled with a power auger through the muskeg into mineral soil. The holes, auger-bored through the muskeg, were kept dry by use of a thin-walled casing. The anchors were backfilled with either glacial till or sand and gravel, hand tamped.

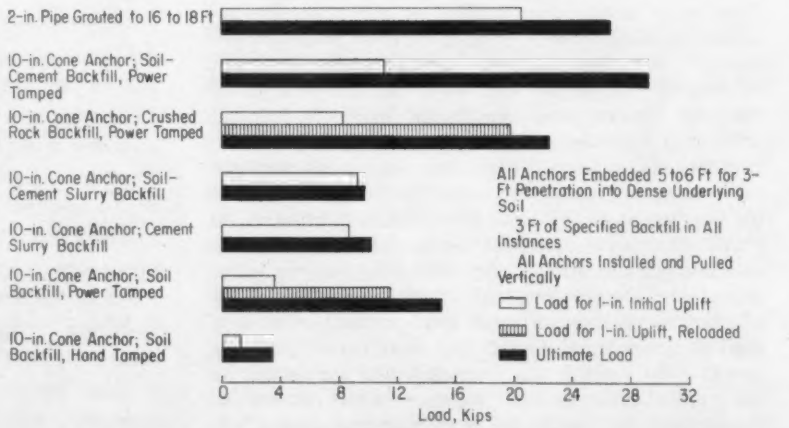
These tests gave low pullout values and showed little consistency. Although the low values were largely due to insufficient depth of embedment in the underlying mineral soil, the uplift movements were too much for good tower-footing design.

Following the Abitibi tests, laboratory tests were made to investigate the uplift resistance of backfill of different types. Backfilling procedures were: 1) mineral soil, hand tamped; 2) mineral soil, power tamped; 3) crushed stone, power tamped; 4) soil-cement mixtures, power tamped; 5) soil-cement slurries; 6) water-cement slurries; 7) pipe grouted into an augered hole.

After a series of model tests, a full-scale field test was carried out with cone anchors installed vertically in the mineral soil in the Toronto area.

These tests demonstrated that if the anchors were loaded to a value near their ultimate capacity and then unloaded, on re-application of the load the magnitude of the uplift movement was considerably reduced especially for anchors backfilled

Anchor Tests at Toronto . . .


2-in. Pipe Grouted to 16 to 18 Ft
10-in. Cone Anchor; Soil-Cement Backfill, Power Tamped
10-in. Cone Anchor; Crushed Rock Backfill, Power Tamped
10-in. Cone Anchor; Soil-Cement Slurry Backfill
10-in. Cone Anchor; Cement Slurry Backfill
10-in. Cone Anchor; Soil Backfill, Power Tamped
10-in. Cone Anchor; Soil Backfill, Hand Tamped
All Anchors Embedded 5 to 6 Ft for 3-Ft Penetration into Dense Underlying Soil
3 Ft of Specified Backfill in All Instances
All Anchors Installed and Pulled Vertically
Load for 1-in. Initial Uplift
Load for 1-in. Uplift, Reloaded
Ultimate Load
0
4
8
12
16
20
24
28
32
Load, Kips

POWER TAMPING AND PRELOADING increases the loading capability of cone anchors tested at 5 to 6-ft depths in the mineral soil in the Toronto area

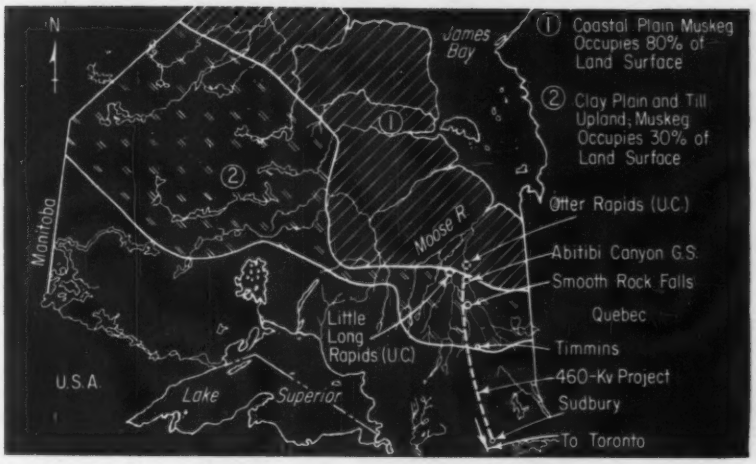
in Muskeg

with crushed stone and soil-cement. Load-uplift curves of the crushed stone backfill tests are shown.

Final field tests were carried out at Smooth Rock Falls. Both soil-cement and crushed stone backfills were used with vertical and inclined anchor installations. The anchors were embedded 5 ft in the underlying soil and at least 3 ft of special backfill was power tamped into place. Expansion, cone and plate type anchors were investigated in these tests.

The crushed stone backfill produced the most consistent and satisfactory results. The soil-cement proved to be highly sensitive to moisture variation, difficult to control in muskeg. The results of inclined anchors, which were installed and pulled at an angle, were unsatisfactory because of installation difficulties. When techniques can be worked out to backfill and tamp in an inclined hole, good results should be obtained with guy-type anchors.

The results at Abitibi Canyon were mostly low because of inadequate embedment in mineral soil. Where embedment was adequate final ultimate capacities were reasonably high, but the uplift movement under load was excessive.



EHV LINES from Abitibi Canyon and James Bay area will cross widespread muskeg deposits in Northern Ontario on their 500-mile route to Toronto area

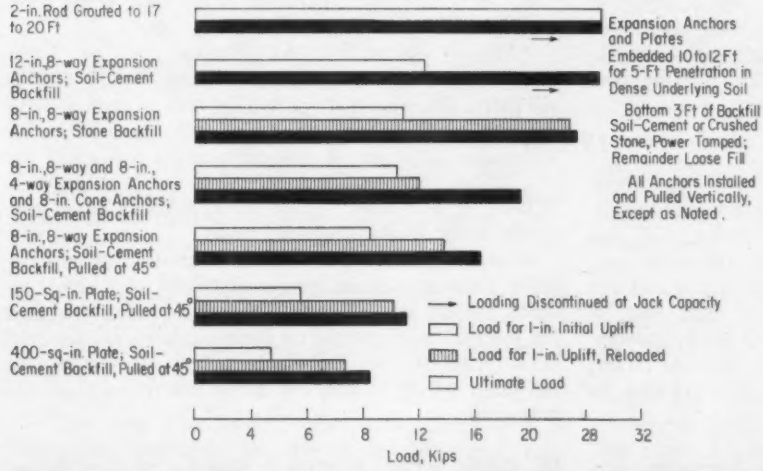
In the initial series the backfill was sand and gravel or glacial till, hand compacted. Although measures were taken which enabled dry filling conditions, hand compaction did not adequately consolidate the backfill. As a result, relatively large uplift movements were measured before appreciable holding strength was developed. In the tests that followed it was found that if backfill materials are made relatively incompressible, such as was possible with soil-cement mixtures or crushed stone mechanically tamped, the holding strength of the anchors develops with much less uplift movement or creep.

Further, the tests demonstrated that if the anchors are preloaded and then unloaded to make the backfill highly over-consolidated, creep is significantly reduced on reloading.

The final test program showed that, of the two types of backfill, the crushed stone was the most satisfac-

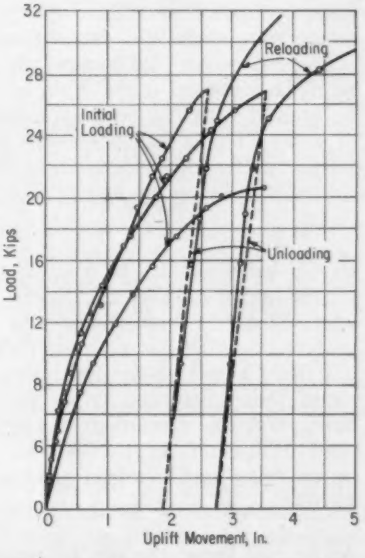
(*Continued on page* 68)

and Smooth Rock Falls Prove Value of Backfilling . . .

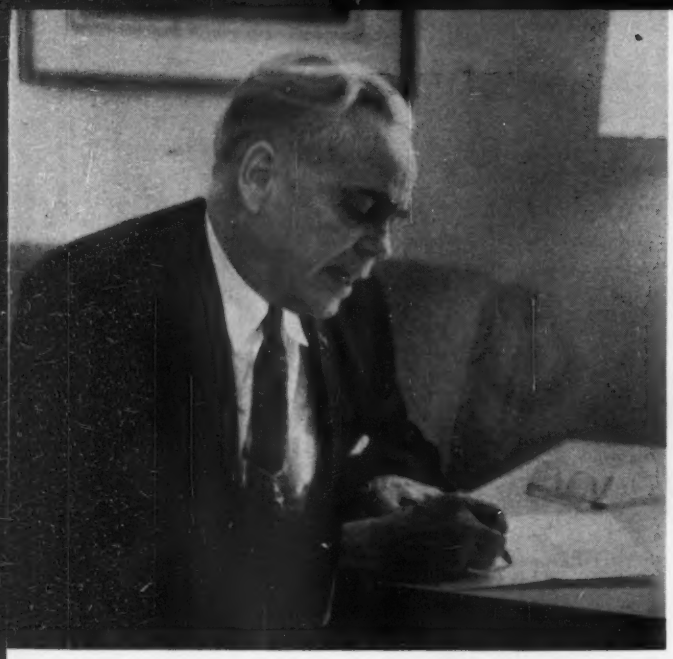

2-in. Rod Grouted to 17 to 20 Ft
12-in.,8-way Expansion Anchors; Soil-Cement Backfill
8-in.,8-way Expansion Anchors; Stone Backfill
8-in.,8-way and 8-in., 4-way Expansion Anchors and 8-in. Cone Anchors; Soil-Cement Backfill
8-in.,8-way Expansion Anchors; Soil-Cement Backfill, Pulled at 45°
150-Sq-in. Plate; Soil-Cement Backfill, Pulled at 45°
400-sq-in. Plate; Soil-Cement Backfill, Pulled at 45°
Expansion Anchors and Plates Embedded 10 to 12 Ft for 5-Ft Penetration in Dense Underlying Soil
Bottom 3 Ft of Backfill Soil-Cement or Crushed Stone, Power Tamped; Remainder Loose Fill
All Anchors Installed and Pulled Vertically, Except as Noted.
Loading Discontinued at Jack Capacity
Load for 1-in. Initial Uplift
Load for 1-in. Uplift, Reloaded
Ultimate Load
0 4 6 8 12 16 20 28 32
Load, Kips

CRUSHED-STONE BACKFILL, POWER TAMPED AND PRE-LOADED, increases capability of anchors sunk into dense soil under muskeg at Smooth Rock Falls

. . .and Preloading



PRELOADING 8-in. expansion anchors reduces subsequent uplift movement



Warren Says

GLENN B. WARREN, elder turbine design statesman who retired in the last months of 1960, speaks here against the background of 30 years in the turbine engineering field. In charge of turbine research for ten years, and in design and development of marine propulsion machinery and axial flow gas turbines for 11 years, Warren has held such major posts as manager of engineering as well as general manager and vice president of the General Electric turbine division.

Glenn B. Warren, former ASME president and GE turbine division vice president, talks exclusively to Electrical World on turbine-generators and power generation concepts for the years ahead.

Q: Mr Warren, as the industry's leading turbine design statesman, what path do you think turbine-generator development will take for the next decade?

A: Well, I can recall that, in 1950, I said we would build a 1-million-kw unit in time. Today, if asked, we could build a 2-million-kw unit, given no restrictions. I believe that the limit is not technical as much as it is economic.

But, even more important in the next decade, development will concentrate on combined cycles, computer-controlled units, use of the low end of the temperature cycle, the once-through boiler, and variable-speed boiler feed pumps and fans. Frankly, I'd be much surprised if the drum boiler will continue to be utilized with the ever advancing steam conditions of today. I also expect that the combined steam-gas turbine cycle with supercharged boilers burning coal will be a reality in the middle 60's, and the way of the future.

Q: GE has sold units of 650,000 kw to TVA. These are the largest capacity units in the world to our knowledge. (Editor's Note: Since this interview, GE has sold two 800,000-kw units to TVA.) Ten years ago, 250,000-kw units were the largest in the world. It seems that larger and larger capacity units will be built. Will this upward trend continue at the present rate? Will a unit of 1-million-kw, or possibly larger, be on order on American electric utility systems by 1970?

A: As you know, the size of systems determines turbine-generator unit rating. The larger the system, the larger the unit capacity; and the larger the unit capacity, the larger the required reserves. The reduced investment for each kilowatt must be larger than the increased investment in reserve capacity on the system. Today the reduction in dollars per kw with larger ratings is becoming more difficult to obtain. However, real progress is being made and with increased technological development, I'm sure even more progress can be made. In addition, the manpower to operate a unit has been reduced to such an extent that any further savings in manpower are of small consequence. However, the manpower per unit of output will decrease as the units become larger. There are still some challenges in justifying economically larger ratings.

I believe, however, that increases in average capacity of new units will continue, probably unabated, but increasing the maximum capability will face major problems soon. For instance, in terms of 1-million-kw units, we face major problems in dissipating flue gases, especially with the increasing amount of sulfur in the coal. At this rating, dissipation of the heat in the cooling water becomes a major problem, too.

Although outage and maintenance rates on larger machines are perhaps higher than we would like to see them, I'm sure that we will be able to reduce these through technological developments. In addition, I would like to point out that automation will affect the unit ratings. For instance, if the first cost of automation is high, it will favor larger units, while if it is low, it will favor smaller capacity units.

Broadly speaking, I think a unit of 1-million or more kilowatts could be on order by an American utility system by 1970. But we should remember that the reserve requirements on large capacity units would be stupendous—and only extremely large systems, in the range of 20 million kw could justify units of this magnitude.

Q: Public Service Electric & Gas Co of New Jersey and the American Electric Power System have both retreated from 1,100F steam temperatures for future

Bigger, Better Units Coming

units because of the high cost of austenitic steels in boilers. What should the industry do, while waiting for a further advance in temperatures?

A: Yes, Jim Harlow of Philadelphia also made a point of the high cost of austenitic steels at the ASME meeting recently. We have to remember that the welding and tonnage requirements make this cost high. However this is not necessarily a retreat.

I can remember that, in 1943-44, Phil Sporn installed a 2,400-psi unit in Twin Branch. He reached out further than he wanted to go. Thereafter he consolidated his position on a plateau. The same thing is true on the Philo supercritical machine. Phil Sporn asked for a 1,200F, 4,500-psi machine; we proposed a double reheat instead. But Sporn said that we had to learn how to work with higher pressures and temperatures; we had to develop new techniques. We've developed new techniques which are resulting in excellent performance by the turbine-generator in the new Breed plant.

In the meantime, we will probably work on other methods of increasing efficiency. First, there's a good prospect that another 50F above 1,050F can be gained with ferritic materials. Second, it seems to me that we can buy more turbine and condenser on the low end of the temperature cycle. Today we're straining to get a 1 to 2% gain in efficiency on the high temperature end of the cycle and neglecting the 1 to 2% on the low temperature end. The use of bigger exhaust to utilize the lower temperature, axial-flow exhaust, buying the next longer last-stage buckets, increasing the cooling water—all of these can help. Third, we complicate our valving to get good light-load economy. Perhaps it's not worth it. A single valve and point of admission would simplify the turbine greatly, make it easier to build, and permit the design of more efficient and higher temperature turbines. Also, in this connection, applying gas turbine technology in cooling turbine buckets would make a contribution. Fourth, we've gone to 3,500 psi and 1,050F on a sound basis. Raising pressure to 4,000 psi and dropping temperatures to 1,000F will give the same economy and might be used to get the increased maximum capacity which could otherwise be had by complicating the overload valves on the turbine. Frankly, I'm not skeptical of double reheat machines. And last, the once-through boiler probably requires less materials and is inherently simpler than the drum boiler. With simpler controls, it probably would be lower in cost—ultimately.

Q: What steps should be taken to develop a steam turbine-generator which has fairly high efficiency over a wide load range and so is more widely adaptable to system load cycles?

A: There are a number of opportunities for improving light-load economy. The use of variable-speed boiler feed pumps, variable-speed boiler fans, sizing the unit to produce its peak output with top feedwater heaters cut off—all of these can help to produce good light-load economy, and would be good measures if properly designed into the plant.

Q: Oklahoma Gas & Electric Co has purchased a combination steam-gas turbine unit of substantial rating. This brings a 4 to 5% increase in thermal efficiency. Why was this possible in 1960 and not, say, in 1955? What do you foresee for this cycle? What other cycles have promise?

A: We offered a 125,000-kw combined-cycle unit in 1954. We've had a 5,000-kw gas turbine in combination with a 12,500-kw steam turbine operating in the Crisp County Power Commission in Georgia since 1958. Frankly I feel that utilities generally lack confidence in gas turbines because they know so little about them. They haven't had the experience with them that the pipe-line and industrial companies have had.

There are two types of combined cycles which can be built. The exhaust-fired type, such as OG&E has bought, requires only a small amount of new development. The supercharged type, however, requires considerable boiler and turbine development work; in this type, the gas turbine inlet, compressor air outlets, and the boiler furnace operate at several atmospheres pressure. For its ultimate development, coal must be burned in the supercharged boiler—something boiler people are reluctant to do. In turn, the ash-laden products of the combustion gases must pass through the gas turbine. Our gas turbine people are working on developments which, when realized, will enable them to propose such units with confidence.

Q: The last few years has seen increased interest in new types of turbine-generators—simple gas turbines, spinning reserve turbines, gas turbines superposed on steam turbines. If all of these types have a place on a power system, how will power systems cope with the increased complexity?

A: I believe that it will lead to a simpler operating system rather than a more complex one. Let me illustrate. For one thing, not every system will have all types of generation. Most systems will have two or three types, each with its own specialized application. Base generation will operate practically all the time. Peaking power—gas turbine—will operate on a basis set by system or local conditions. Being automatic, the gas turbine will introduce no complexity. In addition, I think that computers will help simplify operation of systems.

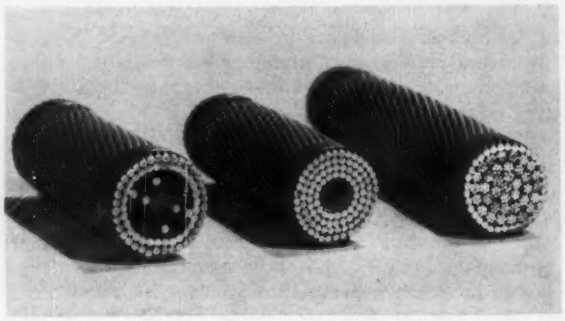
Q: What are the implications of the present trend toward computer control of power plants so far as the turbine designer is concerned?

A: Really, it doesn't create any major problems for the turbine designers, merely some more instruments around the edge. I would even speculate that computer control might enable a higher degree of refinement in turbine design. It would allow the engineer to reduce his margin for contingencies in designing his turbine.

Unique EHV Aluminum Conductors Developed

Aluminum Co of America has developed two unique designs for all-aluminum electrical conductors for installation this spring on Bonneville Power Administration's 460-kv test line, near Sandy, Ore.

The new "Pipeline" conductors are different in concept and expanding medium from Alcoa's ACSR (aluminum conductor, steel reinforced, left). One of the new designs employs flexible conduit cores (center); the other uses—for the first time in a conductor of this size—a "rope lay" configuration (right).

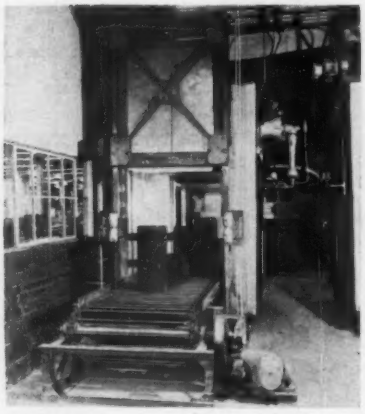


The "flexible aluminum conduit" cable consists of four layers of 5005 alloy wire helically wound around the flexible conduit core. Over-all conductor diameter is 2.14 inches. The flexible conduit core is a standard .825-in. OD flexible conduit.

The "rope lay" 2.13 in. conductor is similar in appearance and structural composition to its namesake, stranded rope. It is composed of groups of wires treated as single strands, helically laid around a similar group serving as the central core. It is encircled with an outer layer of conventional single wire strands. Inner wires are 5005 alloy; the outer layer of strands is EC alloy. This combination meets specified strength and electrical requirements.

Both of the special Alcoa designs may be joined simply, by techniques similar to those used with stranded all-aluminum conductor.

Alcoa's Rome Cable Division is one of five manufacturers supplying conductors for the Bonneville test line, latest of a growing group of EHV (Extra High Voltage) transmission investigations.



Transformers Get Plastic Coat

RT&E Corp is now replacing paint on its pole-type distribution transformers with ARMORTEC, a vinyl plastic exterior coating which is highly resistant to wear and weather. The coating will be fusion-bonded to transformer cover, band, and tank exteriors at no additional cost.

Applied at thicknesses up to 20 mm and oven-cured at 650F in the oven shown here, RT&E says, the vinyl plastic has excellent adhesion, high impact resistance to prevent chipping and scratching, and high insulation qualities to eliminate outages due to birds and animals.

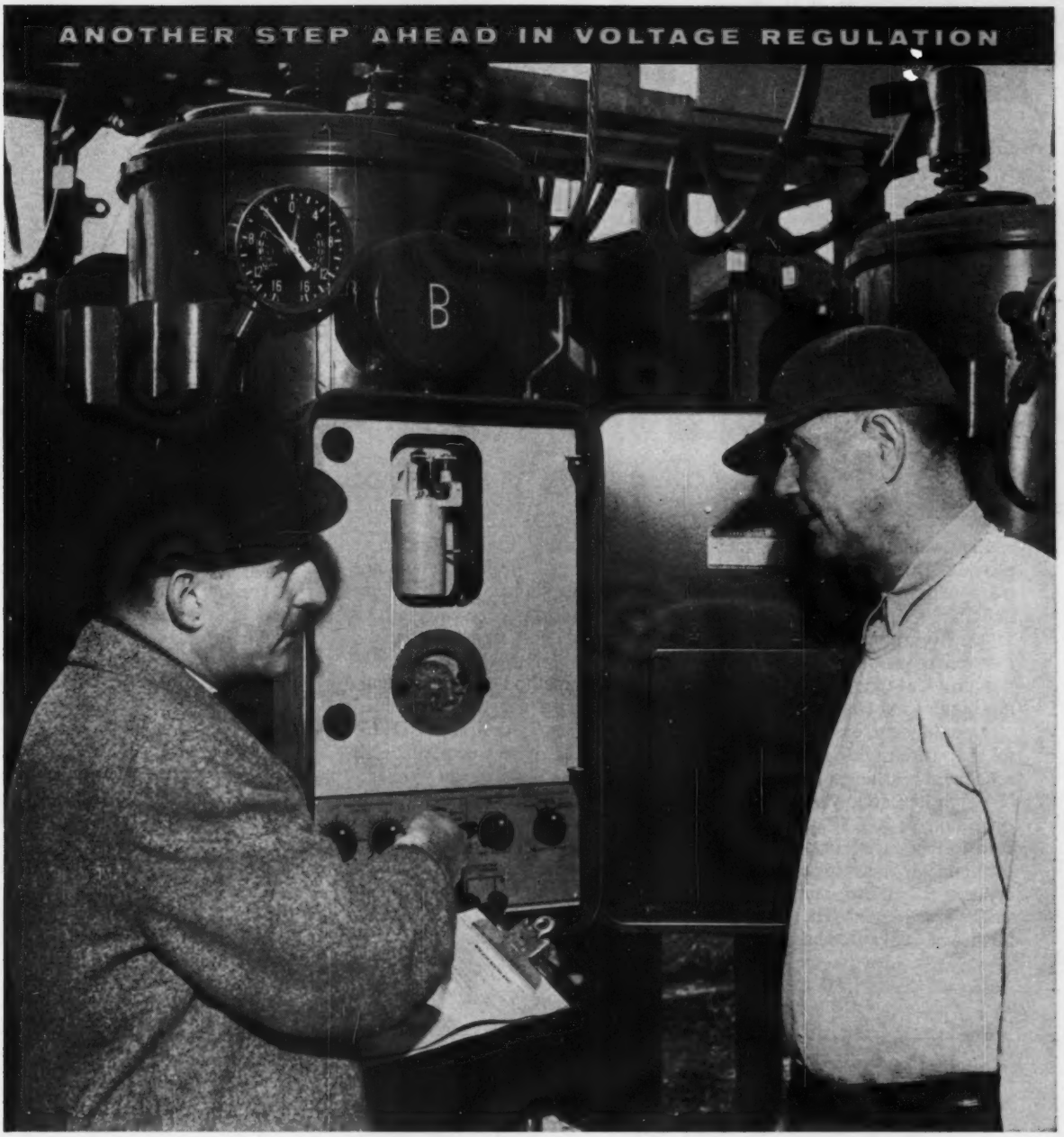
The coating provides a uniform covering on sharp edges and in corners, fills blind spots and corrosion traps around lifting lugs, hanger brackets and accessories. Smooth and unmarred by sag, pock, drip marks or bubbles, the fused-on finish will not chalk, crack or craze.

MANUFACTURERS BRIEFS

• **Farrington Mfg Co** has announced that electric utility companies are taking the lead in the use of Farrington Optical Scanners for posting payments to customers' accounts. Southern California Edison Co, Commonwealth Edison Co, Consumers Power Co, Detroit Edison Co, and Cleveland Electric Illuminating Co have ordered the scanners. Atlantic City Electric Co and Arizona Public Service Co have already installed them in their data-processing billing systems.

• **Granite Construction Co,** headquartered in Watsonville, Calif., is actually responsible for tension stringing the 2.32-in.-dia aluminum single, and bundled conductor for Project EHV. Peterson Engineering Co, Inc, furnished the equipment (EW, Jan. 23, p 79).

• **Fluor Corp, Ltd's** Power Division has been awarded a $3-million contract to construct a 175-Mw steam-electric turbine generator at Kansas Power & Light Co's Tecumseh, Kans., $20-million peaking generator plant. In addition to purchasing major items of equipment and material, KP&L will supply complete drawings and specifications for the plant.



WITH GENERAL ELECTRIC VOLTAGE REGULATORS:

Installation inspection always free!

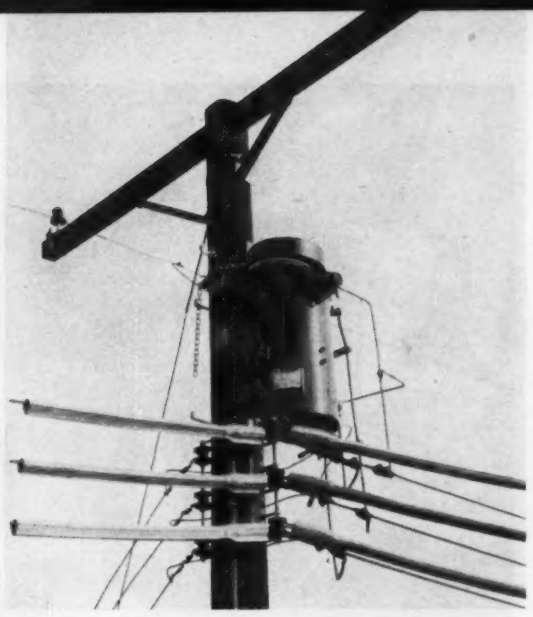
From the moment a General Electric voltage regulator is shipped, field service specialists of G.E.'s Installation and Service Engineering Department are available on a no-charge basis to provide a variety of initial installation inspection services. These services — embracing 18 specific areas—include inspection of new regulators, setting up productive maintenance programs, and training of customer personnel in the operation and maintenance of regulators.

Available through your nearest G-E sales office, these specialists work effectively with General Electric product design engineers on the one hand, and application engineers on the other to provide *the most extensive regulator field service in the industry.*

When you buy General Electric voltage regulators, you are making a TOTAL VALUE investment—of which installation inspection is just one of the dividends. *Voltage Regulator Products Section, Pittsfield, Mass.* 456-07

Progress Is Our Most Important Product

GENERAL ELECTRIC



Temporary Relief Of Overloaded CSP Transformers Reduces Outage Time

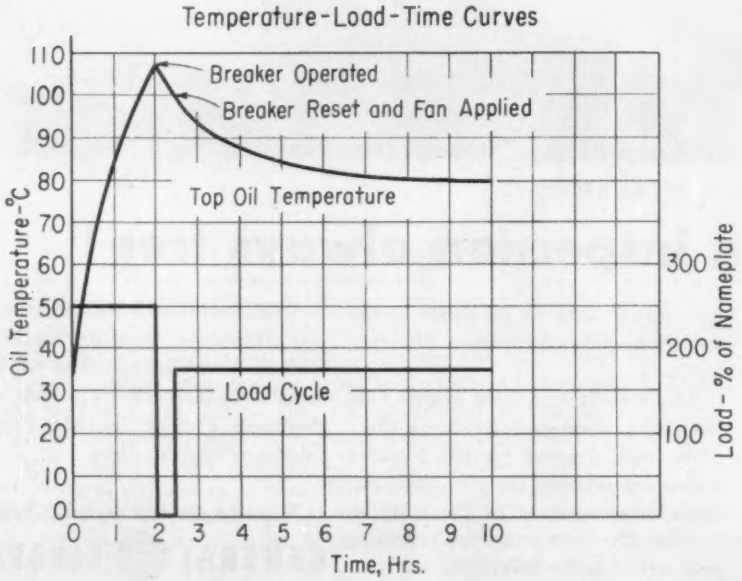
Lightweight blower-type fans provide Duquesne Light Company with quick temporary relief from overloaded transformer to achieve three advantages:

- reduce outage to minimum
- provide time to investigate the overloaded condition
- permit corrective measures to be taken during regularly scheduled working time.

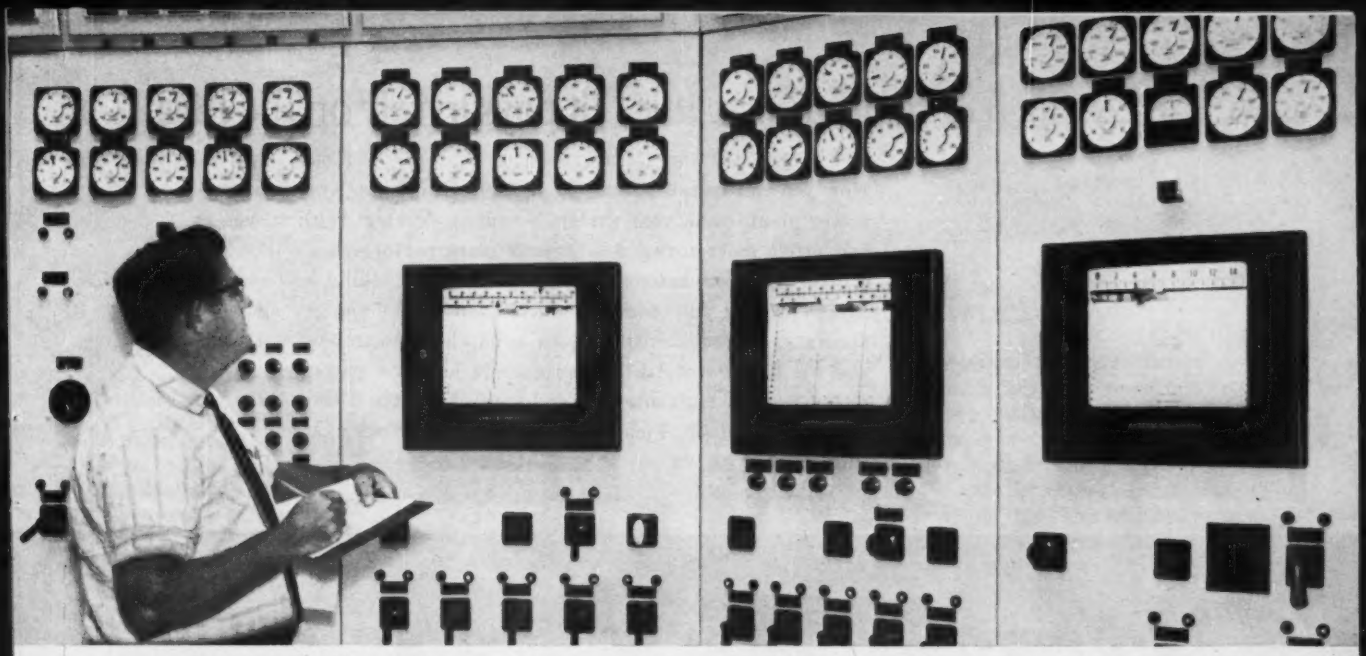
Very often, following a breaker operation of a CSP distribution transformer, it is not convenient, economical or even desirable to replace the transformer with a larger sized unit. The overload might be only temporary and non-recurring; it might occur at a time when a repair crew is not readily available or on premium time; and, replacement with a larger size unit might not be the best solution to the problem.

Some method for quick temporary relief for the overloaded transformer is desirable. DLCo personnel have experimented with some lightweight blower-type fans which can be readily installed by a troubleman.

A laboratory test was conducted using a 15-kva transformer equipped with thermocouples at various locations to measure internal temperatures. A test load of 250% of nameplate rating was applied until a breaker operation occurred. After one-half hour the breaker was reset, a fan installed and the load reduced to 175% of nameplate rating. A half hour was considered to be the average time for a troubleman to get to the location in an actual service operation, reset the breaker and install a cooling fan. As shown by the curve drawn from test data, the top oil temperature of the transformer continued to decrease below the operating temperature of the breaker even though a load of 175% of nameplate rating was maintained.



Fans have been installed in the field on numerous occasions following service operations of the breakers in CSP transformers and in every case service was restored and maintained until the condition was investigated and corrective measures were taken. It is estimated that about 60 to 75 such breaker operations occur per year during normal off-time periods. Assuming an average crew cost of $60 for a transformer change (by a three man crew on premium time) an annual savings in excess of $3,600 is accomplished by use of cooling fans. In addition, the outage time is reduced from 4-6 hours to approximately one half hour which results in a saving in revenue as well as improved customer relations.

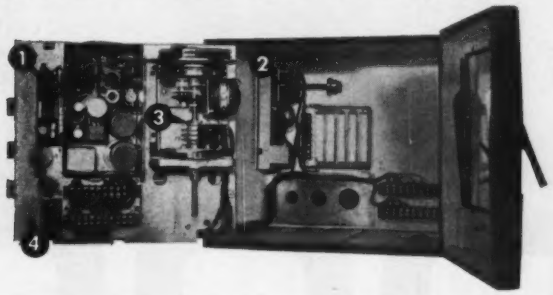


TYPICAL OF GENERAL ELECTRIC UTILITY INSTRUMENTATION is this bank of null-balance recorders and switchboard instruments at Florida Power Corporation, one of more than 80 utilities benefiting from the accuracy and reliability of G-E Recorders.

General Electric Recorder Reliability

Application-proved in Utility Systems Throughout the World

Today, more than ever before, utilities demand the greatest possible recording instrument reliability for monitoring electrical and physical parameters accurately. That is why General Electric, long established in quality instrumentation, offers you a *complete line* of null-balance recorders and recording controllers designed for accuracy, ease of calibration and dependable operation, to meet *all utility applications*. More than 80 foreign and domestic utilities depend upon reliable General Electric Recorders to accurately monitor parameters in central stations, substations and distribution systems.



In your central stations alone, General Electric "system engineers" the necessary instrumentation for your particular needs. This means your recorders, switchboard instruments and switchgear equipment are custom-designed in one coordinated "package" *at no additional cost* and delivered and installed *on time*. At Florida Power Corporation this "package" measures generator watts and vars, field and stator temperatures, turbine bearing temperatures and boiler-feed-pump motor temperatures.

With General Electric multi-point, single and two-pen strip and round chart recorders, *(all ¼% accuracy class, of course)* reliable performance begins on the *inside!* Here are four reasons why:

1. **Silicon diode reference source provides continuous standardization.**
2. **Multi-point selector switch permits remote location.**
3. **Up to 8 control switches; up to 4 transmitting slidewires easily accommodated.**
4. **All components mounted on swing-out panel for easy accessibility.**

GET THE FULL STORY on G.E.'s complete line of recorders and other utility instruments by contacting your nearest G-E Sales Office today; or write to Section 599-05, General Electric Co., Schenectady 5, N. Y., for your free, complete package of descriptive, utility-oriented literature. In Canada, contact Canadian General Electric Co., Limited, 940 Lansdowne Ave., Toronto 4, Ontario.

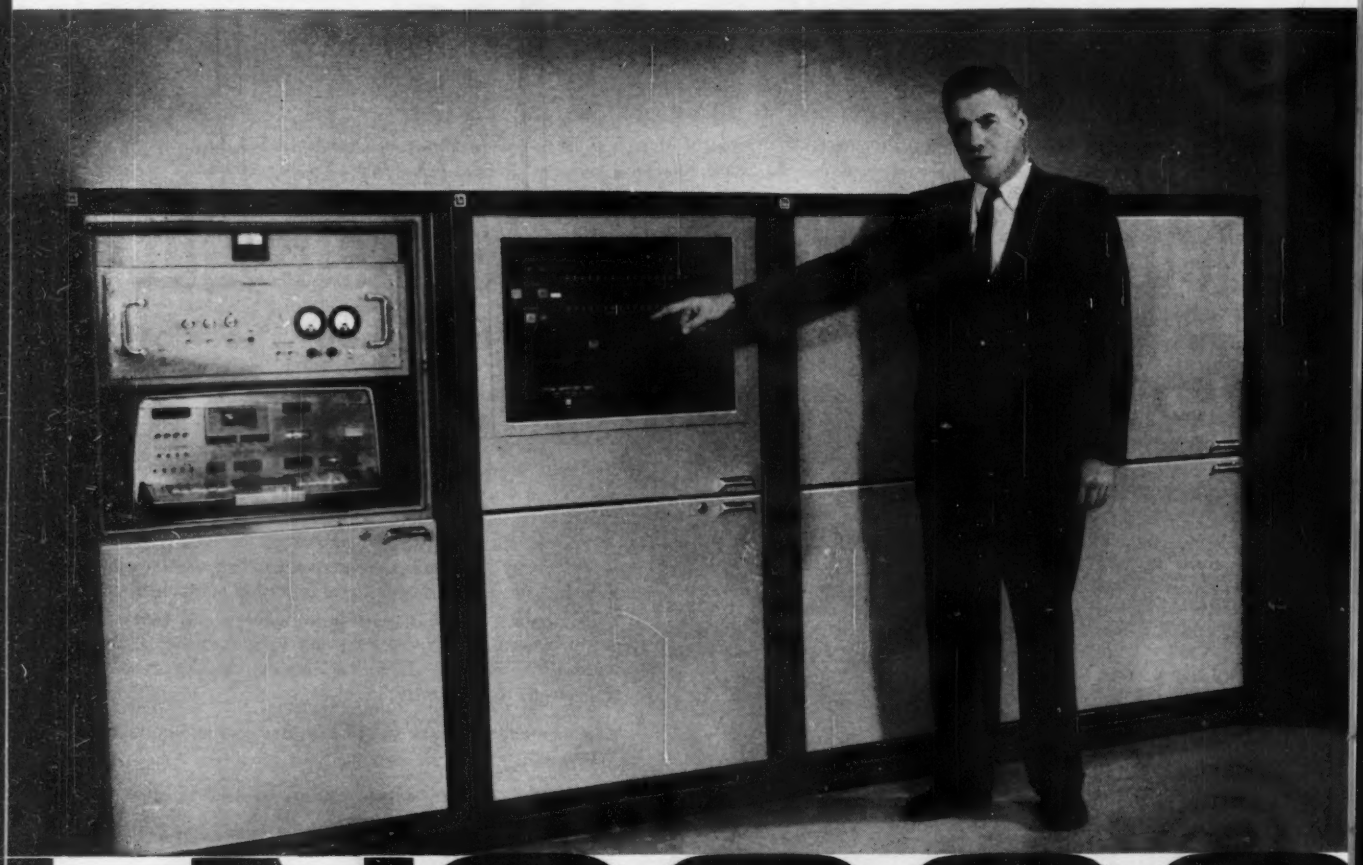
OTHER G-E INSTRUMENTS FOR ELECTRIC UTILITIES: Turbine Supervisory Instrumentation • Switchboard & Panel Instruments • Electric Recorders Automatic Dispatching Systems • High-Accuracy Portables • Vibration Indicators & Recorders • Hook-On Indicators & Recorders • Telemetering Systems

INSTRUMENT DEPARTMENT

GENERAL ELECTRIC

When so much depends on so little, it pays to rely on the best

Now you can install a *dependable* digital computer system in your power plant, or in your system operations center. With it, you can *safely* move forward to *precise* plant performance analysis, plant control or system automatic economic dispatch, billing, and associated functions. Not only does this L&N system give you the speed, accuracy, and reliability of *L&N* solid state electronics, it also gives you the benefits of L&N experience in low-level measurement technology, instrumentation, and control for the *power* industry. Contact your L&N Field Engineer, or 4938 Stenton Avenue, Philadelphia 44, Pa.



LN3000

Digital computer-control systems

LEEDS & NORTHRUP *Pioneers in Precision*

Construction Truck . . .

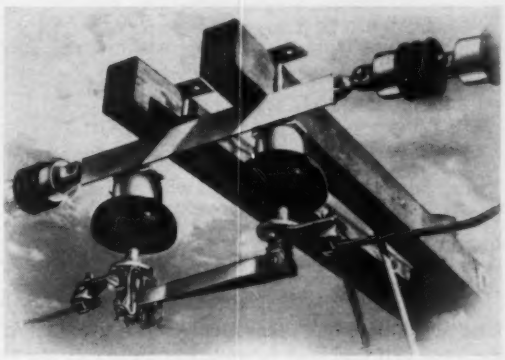
. . . is designed for two-man line construction and maintenance, handling work normally requiring three or four men. Series 555 consists of a 112-in. body, featuring reduced overhang at rear and designed for an 84-in. CA chassis, equipped with a Series PM-30 Pole-Master derrick and Series DF-1 Earth-Master digger. The body contains bin and shelf-equipped compartments, plus ample hooks, racks, troughs and open storage space for tools and materials needed on routine and emergency jobs. Underfloor winch line and numerous other optional accessories can be furnished to meet specific work needs. The derrick, which handles four-ton loads and 55-in. poles, can be mounted on either rear corner of the body. In addition to hydraulically spotting and holding in any position, the derrick head sheave can be hydraulically extended and retracted 56 in.

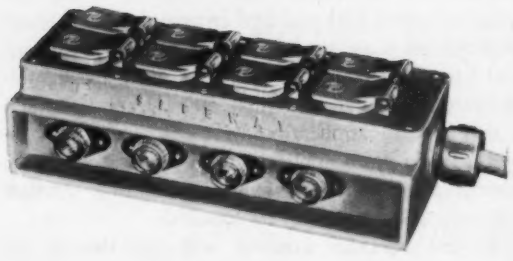
McCabe-Powers Body Co, 5900 N Broadway, St. Louis 15, Mo.

Disconnect Switches . . .

. . . designed specifically for poletop applications, 7.8 to 27 kv, 200 and 400 amp, for instances where insulation levels of the circuits are based on standard distribution equipment. Type M2's insulators are cap-mounted for vertical and underhung installations and the bases are slotted for single or double crossarm mountings.

A. B. Chance Co, Advertising Department, Centralia, Mo.





Receptacle Boxes . . .

. . . are one-piece, molded of safety yellow Neotex, with a cover plate of unbreakable plastic. The new No. 3010 Series is added to Multi-Tap Outlet Box line. User installs his own receptacles. Covers are available for four duplex or four single receptacles and may be ordered with weatherproof flip lids. Provision for fusing each outlet may also be ordered, permitting gang operations with individual circuit protection.

Daniel Woodhead Co, Department MT, 15 N Jefferson St, Chicago 6, Ill.

Nomograph Shows Relationships Between Power Study Factors

R. C. SHEPARD, Senior Asst Engineer, Union Electric Co, St. Louis, Mo.

A nomograph can demonstrate the relationships between many of the parameters involved in system power studies such as heat rate, fuel cost, use factor, capital cost, fixed charges and total annual costs. It accomplishes this by breaking down these parameters into four relationships:

1. The relationship between fuel cost in mills per kwhr, heat rate in Btu per kwhr and fuel cost in cents per million Btu is shown in the upper right quadrant.

2. The upper left quadrant relates annual fuel cost in dollars per year per kw to use factor in per cent and fuel cost in mills per kwhr.

3. The lower right quadrant defines the relationship between annual fixed charges in dollars per year per kw, capital cost in dollars per kw and rate of fixed charges in percent per year.

4. Graphical addition in the lower left quadrant sums the annual fuel cost and the annual fixed charges to give total annual costs (fuel and fixed charges) in dollars per year per kw.

The over-all nomograph, by combining these relationships, defines total annual costs as a function of heat rate, fuel cost, use factor, capital cost and rate of fixed charges and thus gives a better insight into these relationships. It can also be used to solve the relationships solely in any one quadrant or combination of quadrants, either forward or backward.

By modifying the methods of application further, less evident applications can be found. If heat rate is entered incrementally, fuel cost is found incrementally. It should be noted that the fuel cost in mills per kwhr and the annual fuel cost include fuel only. However, by entering the chart on the mills per kwhr scale with incremental cost, which includes maintenance and labor, then the resulting incremental annual fuel costs will include these other factors.

The nomograph can be used to find the value in capital cost of any change in the heat rate of any particular unit. This can be accomplished by finding the annual fuel cost at the appropriate use factor of this difference in heat rate at the proper fuel cost in cents per million Btu. Then by taking this value of annual fuel cost and entering on the annual fixed charges scale, the capital cost related to this annual fixed charge can be found by using the associated rate of fixed charges. The nomograph is limited in this type of application by the scale range covered. To be more applicable, the center part of the nomograph should be enlarged so that smaller heat rate differences can be handled.

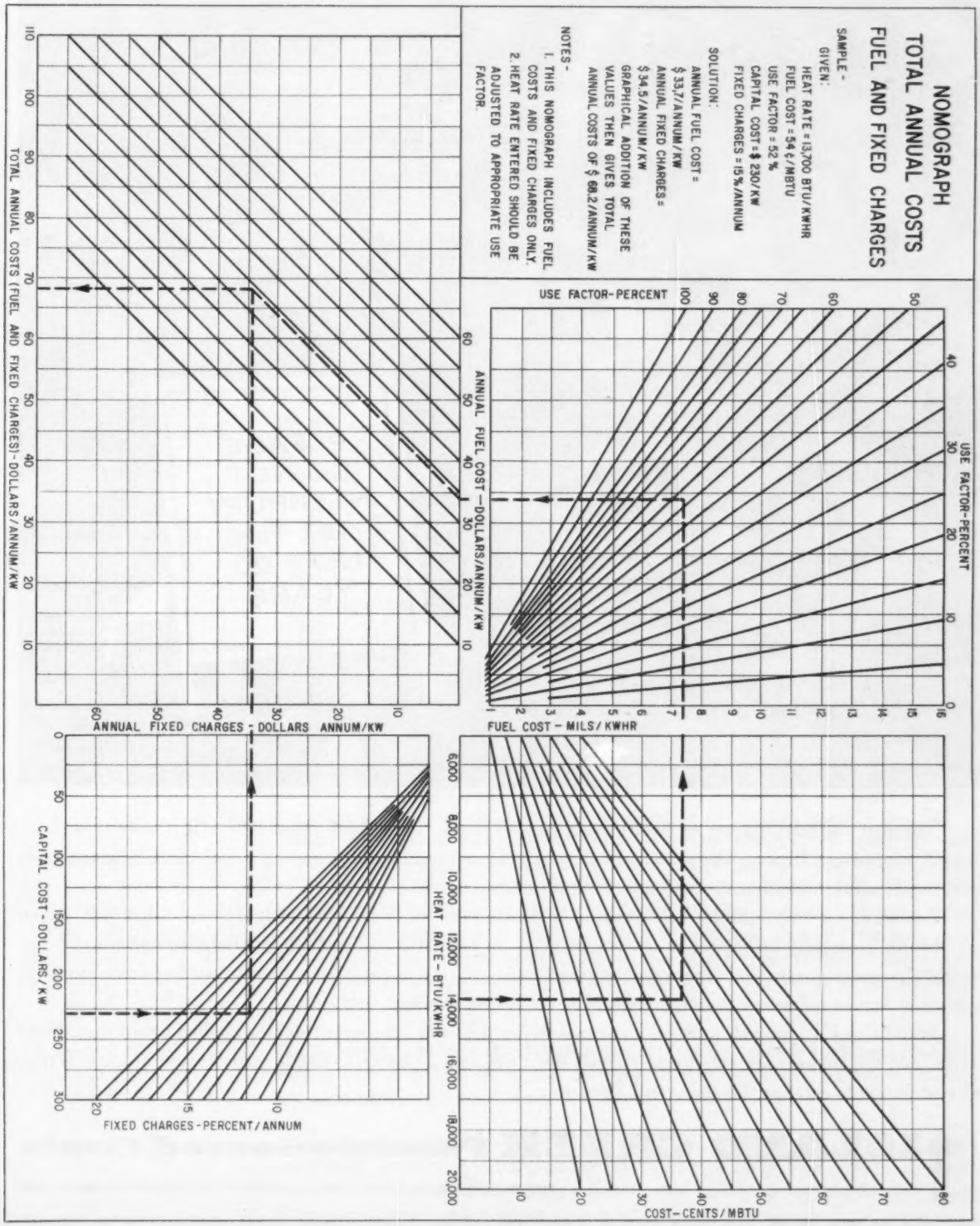
As one becomes familiar with the use of the nomograph, other uses will present themselves.

NOMOGRAPH
TOTAL ANNUAL COSTS
FUEL AND FIXED CHARGES

SAMPLE -
GIVEN:
HEAT RATE = 13,700 BTU/KWHR
FUEL COST = 54 ¢/MBTU
USE FACTOR = 52 %
CAPITAL COST = $ 230/KW
FIXED CHARGES = 15 %/ANNUM

SOLUTION:
ANNUAL FUEL COST =
$ 33.7/ANNUM/KW
ANNUAL FIXED CHARGES =
$ 34.5/ANNUM/KW
GRAPHICAL ADDITION OF THESE
VALUES THEN GIVES TOTAL
ANNUAL COSTS OF $ 68.2/ANNUM/KW

NOTES -
1. THIS NOMOGRAPH INCLUDES FUEL COSTS AND FIXED CHARGES ONLY.
2. HEAT RATE ENTERED SHOULD BE ADJUSTED TO APPROPRIATE USE FACTOR.


USE FACTOR-PERCENT
FUEL COST - MILS/KWHR
USE FACTOR-PERCENT
ANNUAL FUEL COST - DOLLARS/ANNUM/KW
ANNUAL FIXED CHARGES - DOLLARS ANNUM/KW
TOTAL ANNUAL COSTS (FUEL AND FIXED CHARGES) - DOLLARS/ANNUM/KW
HEAT RATE - BTU/KWHR
COST - CENTS/MBTU
CAPITAL COST - DOLLARS/KW
FIXED CHARGES - PERCENT/ANNUM

The man who buys coal for an electric utility knows that he must think about 1981 as if it were a lot closer than 20 years away. Because the contract he signs today must embrace his company's coal needs for many years to come. It must contain answers to questions like these:

Can we count on an uninterrupted supply of the kind of coal we must have? Is this coal laden with hidden incremental costs over and above its invoice price . . . in excessive coal and ash handling, equipment outages, freight charges on inerts, and other operating inefficiencies? Or is it coal that will make our burning equipment operate at *highest* efficiency, delivering steam at the lowest possible cost?

Island Creek's approach to these questions shows the same long-term thinking applied by utilities themselves, and the answers are reassuring indeed. We'd welcome a chance to tackle *your* 20-year queries. Write, wire or phone to arrange this important discussion.

ISLAND CREEK Precisioneered Coals

You can depend on Island Creek . . . a career company dedicated to coal

ISLAND CREEK COAL SALES COMPANY, Chafin Building, Huntington 18, West Virginia • Chicago • Cincinnati • Cleveland • Detroit • Greensboro • New York • Pittsburgh

Electrical World

FEBRUARY 20, 1961

Management Newsletter

All's Quiet in Housing

The countryside was a noisy place in 1959. Bulldozers were chugging, graders grinding, and thousands of hammers were banging away. It was said that if you stood in one place long enough, someone would build a house around you. But that was 1959. Things are pretty quiet now. And to a new Administration, determined to get the economy moving, the silence is hardly restful.

Translating the sound into figures gives a good idea of the size of the housing slump. In January, 1960, new houses were going up at a seasonally adjusted rate of about 1,366,000 a year. But by December, the annual rate was slightly under one million. This was about 23% below the figure for housing starts in December, 1959. If this drop affected only the construction industry, it would be bad enough. But the number of new home starts is important to a very broad section of the economy. Each house that isn't built means about $575 worth of electrical equipment that won't be bought and 3,815 kwhr a year that won't show up on a meter. It's a dozen cans of paint that won't be sold, and about 25 windows that won't need glass. Several hundred square feet of carpet won't find a home, and a new washing machine won't be needed. There are even a few sacks of grass seed around that won't be planted.

So, in looking out over the New Frontier, President Kennedy's advisers couldn't help but be concerned by all the idle bulldozers and hammers. But how do you get them back into action?

Mortgage rates take a lot of the blame for the lack of housing starts. They're too high, some people say, pointing at the 6% figure. Certainly high rates mean extra dollars tacked on to the monthly payments. And perhaps many families that need a house just aren't in a position to live with the added expense.

If this is the heart of the problem, then the Administration can do something about it. First of all it can cut the rate on government insured mortgages, something which it has already done in dropping FHA rates from 5¾ to 5½%. Secondly, it can make more mortgage money available through the operation of the Federal National Mortgage Assn, a government agency. FNMA (dubbed Fannie Mae) acts as a mortgage wholesaler for private lending institutions. It could step up its mortgage buying operations, and cut back on its sales to the private market. This would give banks a fresh supply of funds to put into new mortgages, and would also encourage them to seek out homebuilding contractors who need money.

But is the problem solely one of high interest costs? Or does it go a bit deeper? There's evidence that a good part of the slowness in housing may be due to lack of demand. If this is true, then simple monetary manipulations probably won't solve the problem.

Vacancy rates are an important indicator of the nation's need for new homes. The more housing units that are available for occupancy, the less demand there is for new construction. And vacant housing units have been increasing. Of all the nation's homeowner units, 1.2% are vacant and looking for a buyer. This represents a 10% increase over the average figure for 1958 and 1959 when 1.1% were looking for customers. Homeowner vacancies are highest south of the Mason-Dixon line and east of the Rockies where the average is running around 1.7%.

Rental vacancies are important too. People who have satisfactory living accommodations, even though rented, are under little real pressure to go out house hunting. These vacancies are rising as well. About 7.6% of the acceptable housing units available for rent are presently unoccupied. This is up from 6.4% in 1959, and 2.6% in 1950. In this category states west of Texas and the Dakotas lead with a figure of 11.4%.

These figures are by no means perfect indicators of the need for housing. Many of the vacancies may be in types of homes which are unattractive to American families, or may be in areas where job opportunities are limited. And even though the Department of Commerce classifies the vacancies as "not dilapidated," they may have deteriorated enough to be unacceptable to many prospective buyers. But the figures do indicate that the home construction industry is experiencing a phenomenon that is becoming increasingly common throughout the economy. The seller's market is dead. Builders can no longer put up merely adequate homes on inaccessible plots and expect to sell a hundred units before they even break ground. Buyers now have a solid roof over their heads. They can be pretty choosey about what they buy.

Besides the number of unoccupied housing units, there's another reason why people aren't pounding on builder's doors with down payments in their hands. This is the mood of pessimism that runs through an economy whenever business indicators begin to fall. Heads of families, like chiefs of business firms, become uncertain about the future. They are uneasy about making a big investment (for most families the biggest investment they make) until the economic climate shakes itself out. When business began to slump early in 1960, people cut back on home buying. And they may hesitate to commit the cost of a new house until business shows some real signs of strength.

This lack of demand makes it hard for the government to stimulate housing starts merely by chopping down the mortgage rates. For a ¼% drop in the FHA rates isn't big enough to create demand where there is none. It amounts to a saving of $1.50 a month on a 25-year $10,000 mortgage, hardly enough to entice someone into the market who really doesn't need a house. Naturally, the government would like to push mortgage costs down further until they reached the point where the value is irresistable. But the gods who watch over the money market just won't allow it.

For one thing, if mortgage rates dropped much lower than other money costs, there would be no flow of funds into mortgages. A good example is the veteran's 5¼% mortgage. Bankers won't lend money at this level because they feel obligated to earn the going market rate which is substantially higher. In order to drop mortgage costs significantly, the government would have to put downward pressure on money rates in general. And there is a limit as to just how far rates can fall without aggravating the nagging balance of foreign payments situation.

If government's role is limited, who can help solve the problem? Certainly bankers can assist home construction. And they undoubtedly have reason to try. Already bank vaults are bulging with an excessive supply of funds, available for mortgages, because of the tremendous increase in personal savings. Naturally, bankers are anxious to get this money into investments, and there are a number of ways they can make mortgages more inviting in spite of the interest costs. In the typical mortgage there are many contract terms such as downpayment requirements, amortization provisions, contract maturities, and non-interest costs which are negotiated on an individual basis. By tying these into a more enticing bargain, bankers can offset to some extent the high rate. But even this probably won't be enough.

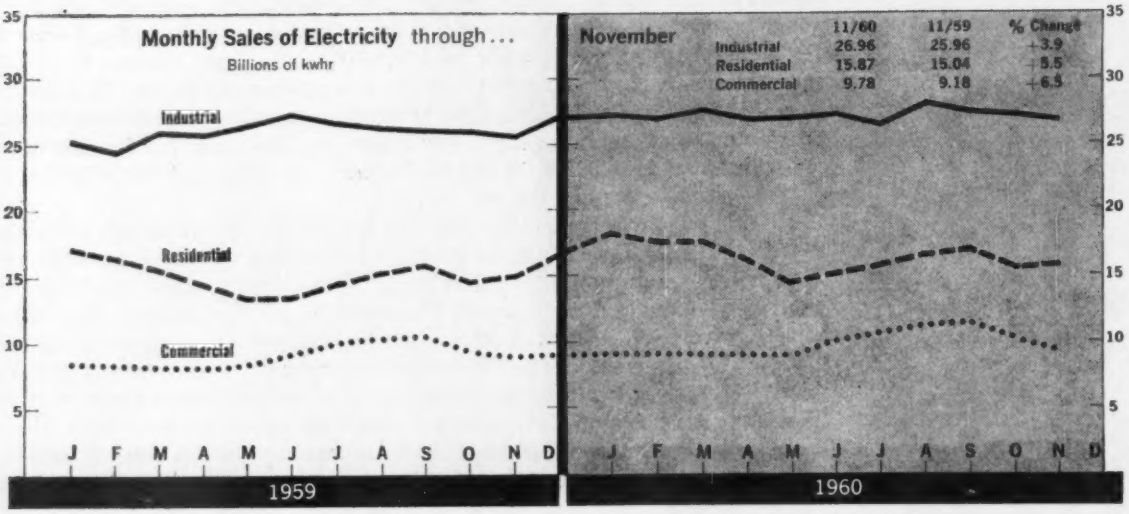
The future of housing seems to rest with the builders. It's a buyer's market, and in order to push sales builders simply have to offer more value in new homes. They themselves must find ways of cutting their costs so that they can put up an attractive well-built house at a price that the average American family will find exciting.

Can this be done? Bankers feel that it can. They point to one American builder who has a national reputation for offering top value. His latest project, they say, was sold out long before it was completed. If other builders could offer the same kind of value, many families would quickly decide that they wanted a new home.

Construction firms are certainly aware of this situation. But a new house takes a long time to get from the drawing board into the sunshine. How much time? Quite a bit according to past experience. In 1956, Congress adopted measures designed to stimulate special housing categories. But many months dragged by before housing starts rose significantly. Similarly, the Administration tried to reduce home construction during the 1955 business boom. But new starts kept right on soaring for more than half a year. There are many months involved in planning before a trend in housing can be changed. And manipulation of interest rates can't cut that time significantly.

Builders have to consider the widely divergent housing needs and tastes of the public. They must study new locations, accessible to transportation and close to the centers of employment. They have to plan landscaping, and methods for laying out new communities. And if they want the houses to sell in today's market, then all this planning must be particularly painstaking and exact. A builder who gets careless and misses the desires of the buyers stands to end up with a town of empty houses on his hands. At the same time, they must be taking a severe account of their basic construction techniques with an eye for possible ways of trimming costs without shaving quality at the same time. Today's buyer is more cost-conscious than those of the Forties and Fifties.

Because all these ingredients must be developed and properly blended, the upturn for housing is still many months away. Certainly a limited low-cost money policy by the Administration won't hurt the construction industry, but it probably can't rush the recuperation. The seasonally adjusted figures for housing starts may not show a strong climb until the fall. And even then the gains won't be strong enough to make 1961 a banner year. The total number of starts will be just slightly better than 1960. So, the countryside will still be pretty quiet compared to 1959.



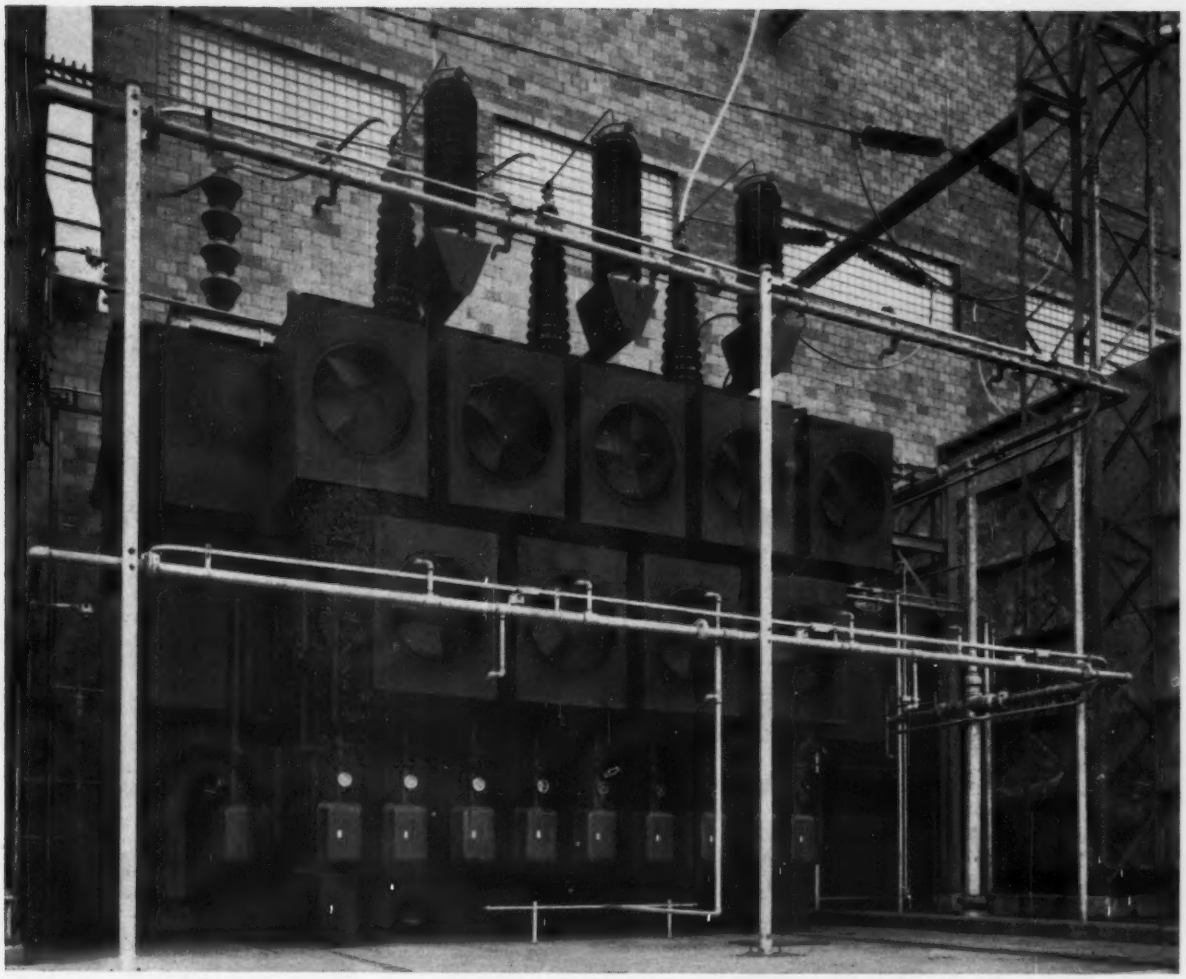
Power Statistics

		Latest Month	Year Ago	Annual Change %
Capacity		166.31	155.85	6.7
Dec. '59 Peak... million kw	Nov.	121.6	113.5	7.2
Est. Dec. '61 Peak		143.3	143.3	...
Production—billion kwhr	Nov.	61.4	58.5	5
Hydro		10.8	11.7	−7.8
Fuel		50.6	46.8	8.2
Sales—billion kwhr	Nov.	55.76	53.01	5.2
Residential		15.87	15.04	5.5
Commercial		9.78	9.18	6.5
Industrial		26.96	25.96	3.9
Other		3.15	2.83	11.3
Fuel Consumption				
Coal—million tons		14.9	14.3	3.8
Oil—million barrels		7.8	7.7	1.4
Gas— billion cu ft		127.5	113.2	12.6
Net Income Class A & B Co's—$ million		142.07	134.98	5.3
Residential Customers—million	12 mos.	49.89	48.88	2.1
Revenue per kwhr	ended	2.47¢	2.51¢	−1.6
Avg kwhr per customer	Nov. 30	3,776	3,562	6.0
Avg annual bill		$93.27	$89.41	4.3

Business Statistics

Indexes:				
FRB Industrial Production (1957 = 100)	Dec.	102	107	−4.7
ENR Construction Cost (1949 = 100)	Feb.	174.9	170.4	2.6
BLS Cost-of-living (1947–49 = 100)	Dec.	127.5	125.5	1.6
New Orders for Machinery (1950 = 100)	Dec.	161	164	−1.8
NEMA Sales				
Insulation materials	Nov.	123	141	−12.8
Electric appliances, est.		85.3	103.4	−17.5
GNP—annual rate—$ billion	3rd qtr	492.7	480.0	2.6

Significant Changes: FRB Index of Industrial Production for December was down 4.7% (on new 1957 = 100 base) from previous year. Drop is biggest since Aug., 1958.



Grinnell Water Spray system protects transformers from fire at Phillip Sporn Station

Grinnell fire protection systems guard one of America's largest power stations against shut-down by fire!

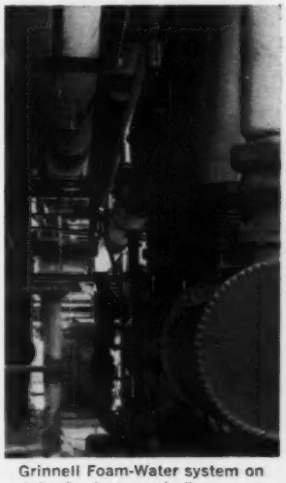
The 450,000 KW Unit No. 5 of American Electric Power Company's Phillip Sporn Station at New Haven, West Virginia, makes it one of the largest in the country. Guarding this giant power station against fire — dependable Grinnell fire protection systems.

Look at this fire protection line-up!

Grinnell Water Spray systems protect two main transformers, two auxiliary transformers, the reserve auxiliary start-up transformer, the vital sections of the coal conveyor system, cable trays, auxiliary boiler feed pump oil tank, and the stator and seal oil unit. Grinnell Foam-Water system protects the basement floor area in the vicinity of the turbine pedestals.

Grinnell-installed Carbon Dioxide systems protect the main boiler feed pump oil tank and the turbine oil and lube oil tank rooms. Grinnell-installed Dry Chemical systems protect the main turbine bearings, the stop and intercept valves, and the pedestal cavity behind the front standard.

Remember, whatever *your* fire protection needs, there's a Grinnell system just right for you. Send for the reprinted article, "How Good Is Your Fire Protection?", which details fire protection for generating stations. Write to Grinnell Co., Providence 1, R. I.

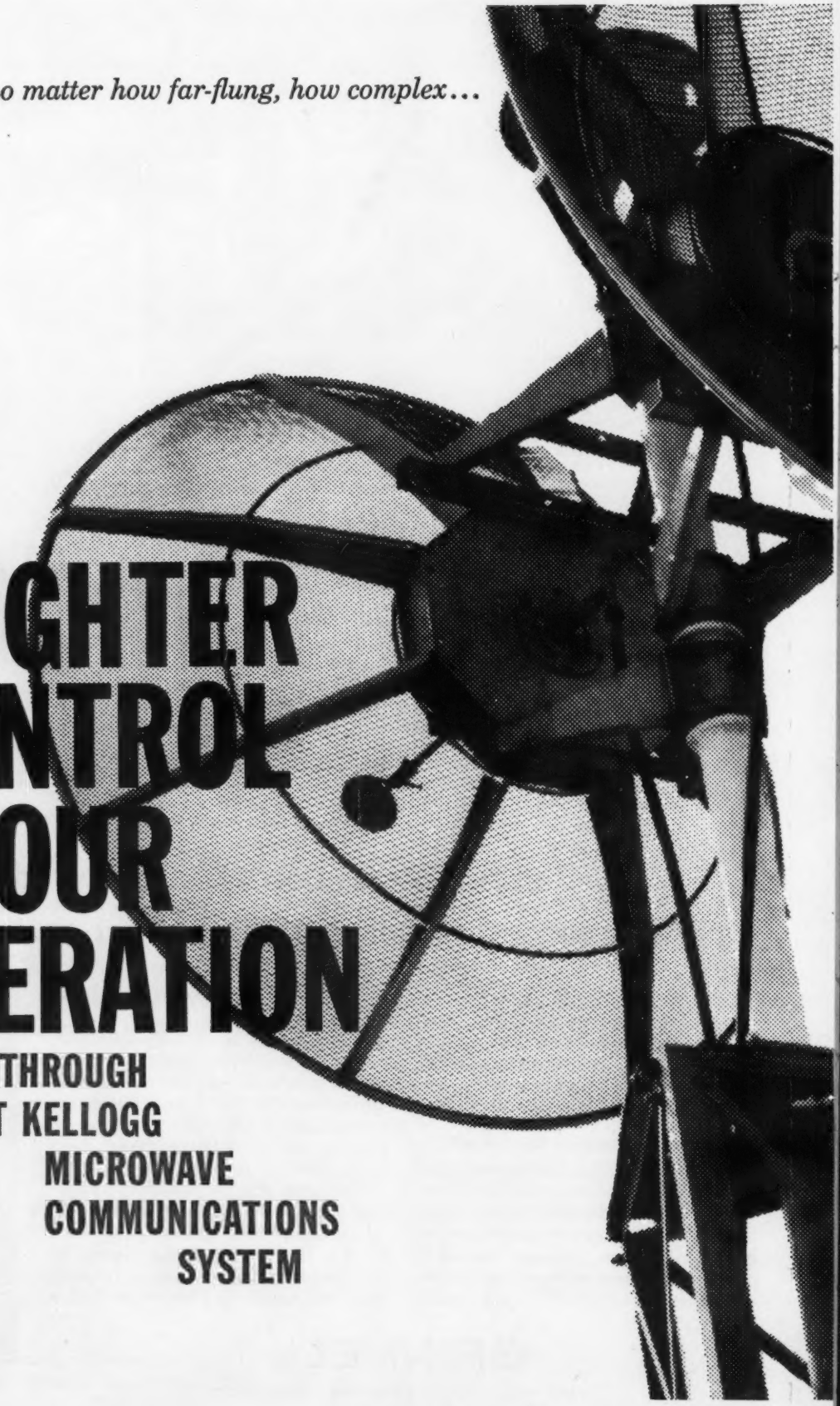


Grinnell Foam-Water system on duty in basement floor area

GRINNELL

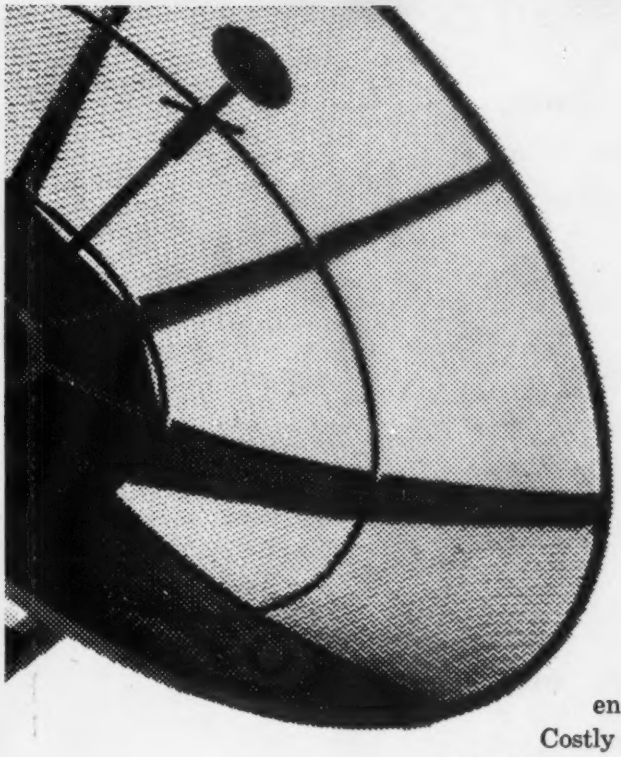
FIRE PROTECTION SYSTEMS SINCE 1870

no matter how far-flung, how complex...



TIGHTER CONTROL OF YOUR OPERATION

THROUGH ITT KELLOGG MICROWAVE COMMUNICATIONS SYSTEM

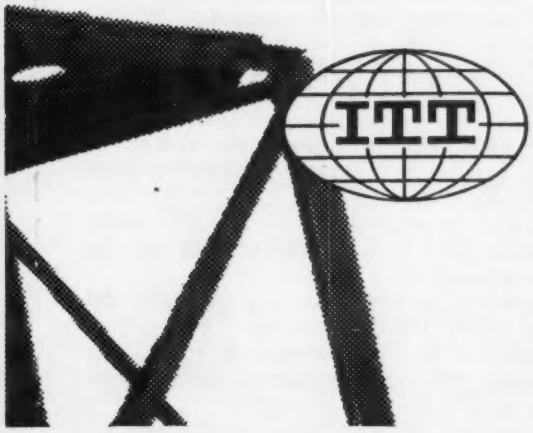


For constant and instant communication—with personnel or plant equipment—over any distances, modern low-cost ITT Kellogg microwave systems offer advantages no ordinary or expensive wire-line system can match! Trouble-free microwave communication stations span your points of operation from end to end, keep your entire organization in instant, uninterrupted touch. Costly breakdowns in communications (due to bad weather, broken lines, power failures) never again hamper your operations.

Certain channels of your microwave system can be adapted to perform important telemetering and remote control functions over equipment great distances away. Other channels can be assigned to data transmission, still others to voice transmission. Multiple frequency voice channels mean as many as *ninety* of your key men can, if necessary, be in *personal* communication—all at the same time!

Private microwave systems, pioneered by International Telephone and Telegraph, are today being employed by many of America's leading companies in the fields of oil, gas, railroading, trucking and other fields requiring constant communication over far-flung systems of operation.

An ITT Kellogg communications consultant will be glad to explain microwave to you in detail. Simply write:



ITT

KELLOGG

A Division of
International Telephone & Telegraph Corporation
6650 South Cicero Avenue, Chicago 38, Ill.

Telephone and Transmission Dept.
2912 Wake Forest Road, Raleigh, N. C.

Regional Offices and Warehouses:
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GEORGIA: 1594 Southland Circle, N. W., Atlanta 18, Ga., SYcamore 4-2441
INDIANA: 802 Knitters Ave., Fort Wayne, Indiana, Eastbrook 4562
IOWA: 1111 East River Drive, Davenport, Iowa, 324-0441
KANSAS: 7th & Sunshine Road, Kansas City 15, Kansas, MAyfair 1-4418
NEW YORK: 327 North West Street, Syracuse, N. Y., HArrison 2-8251
TEXAS: 1359 Motor St., Dallas 7, Texas, Riverside 7-5191

ITT Kellogg products available in Canada through
Standard Telephones & Cables Mfg. Co., Ltd.
9600 St. Lawrence Boulevard, Montreal 12, P.Q., Canada

Rural Program Adds 9,000 Lights in 1960

M. T. GEDDINGS, Manager, Agricultural Engineering Department, South Carolina Division, Duke Power Co, Spartanburg, S. C.

Two years ago the cities and towns in the Piedmont Carolinas were all lighted up at night but most rural areas were still in the dark.

Today, dusk-to-dawn lighting is being installed at a rate of 800-900 units a month. Almost 9,000 lights were added last year.

For progress of the tremendous growth of the Outdoor Lighting Service Program over the past two years see the chart below.

Of the lamps presently in service, 10% are 6,000 lumens incandescent, 78% are 7,000 lumens mercury vapor, and 12% are 20,000 lumens mercury vapor.

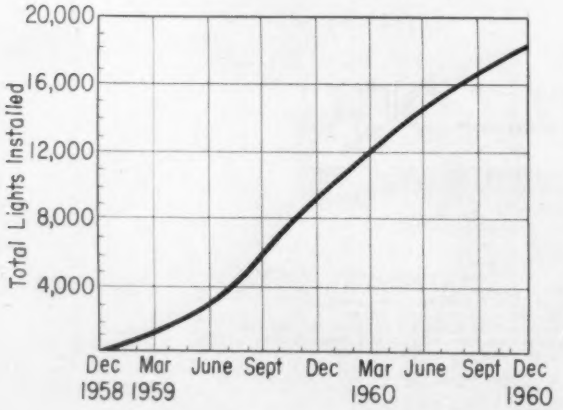
The lights are installed for both customers in cities and in rural areas. Approximately 80% of the lamps have been installed in the latter.

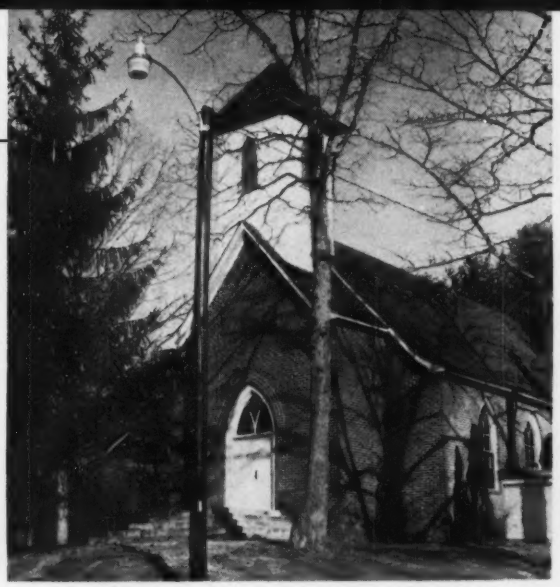
Duke Power Co began a study of outdoor lighting early in 1958 and decided there was a need for this type of service. The company then found a luminaire to meet the specific requirements of simplicity, efficiency in operation, and a minimum of maintenance.

The Outdoor Lighting Service was then inaugurated in November, 1958.

The dusk-to-dawn service was established without fanfare or publicity and at the time was considered just another lighting service for customers who wanted this type of illumination. The service was announced in the January, 1959 issue of *Electricity on the Farm* magazine, but no sales efforts were advocated to promote the activity.

Growth of Outdoor Lighting Service





Types of lamps available and the rate schedule:

Lamp rating in lumens	Type of lamp	Per lamp per month
6,000	Incandescent	$3.00
7,000	Mercury vapor	3.00
20,000	Mercury vapor	5.00

Through the use of a photo-electric cell these lamps burn from approximately one-half hour before sunset to one-half hour before sunrise.

All facilities necessary for this outdoor lighting service including fixtures, lamps, controls, poles, hardware, transformers, conductors and other appurtenances are owned and maintained by the company.

The company will replace burned out lamps and otherwise maintain the fixture during regular daytime working hours, upon request from the customer.

The location of the lamp or lamps is designated by the customer, but if the number of poles required to serve the lamps from the company's nearest distribution facilities exceeds the number installed, a monthly charge of 50¢ per excess pole is made.

The service is available to individual consumers and to real estate developments located on Duke Power's distribution system.

Since the outdoor lights offered at the low rate are "standard package" items, the following special types of installations, which had been suggested by customers, cannot be made.

1. Switches of any kind installed in the circuit supplying these lights, even at the owner's expense.

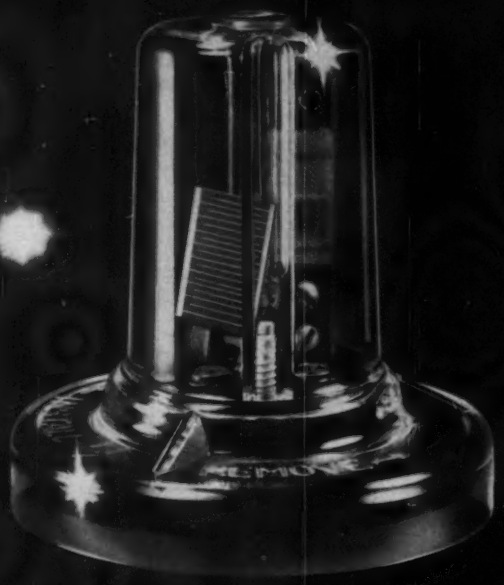
2. Lights served from underground cables, even if the customer pays for the underground circuit.

3. Lights installed on buildings, structures or poles belonging to the customer.

All lights must be installed on Duke Power Co poles, or on telephone poles for which the company pays the standard attachment fee.

If a customer wishes to deviate from the lights and installations shown in the rate schedule it is suggested that he engage a private contractor to furnish the materials and make the installation, wiring same through the meter.

Precision



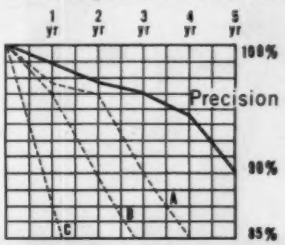
More than HALF A MILLION times a day...
this Photocontrol outperforms all others

Put this Precision control beside **any** other — and you'll see the difference in simplified, miniaturized, long life engineering and construction. Put Precision on the line and save the difference. This control that revolutionized the multiple street lighting system 5 years ago now is used on more installations than any other make at any price.

No other control gives you so much **field proof** of performance under all conditions. No other control approaches the trouble-free simplicity of Precision's two-component circuit.

It is this advanced engineering that insures your system against all fail-out hazards of tubes, transistors, printed circuits, magnetic relays, capacitors, other components of complex photocontrols.

Yet Precision costs less to buy, less in the long run because it uses up to 18 fewer components. No wonder major utilities make the most of modern outdoor lighting with Precision — a truly perfected photocontrol. Write or Wire for Technical Data.



LIFE EXPECTANCY OF LEADING PHOTOCONTROLS

Weatherometer tests and field service prove that Precision outlasts other controls by 1 to 4 years. It pays for itself in replacement labor economies every year.

PRECISION MULTIPLE CONTROLS, INC.
Ridgewood, New Jersey

The difference between night and day

Southwestern Electric Service Names VP

Charles D. Goforth has been elected a vice president of Southwestern Electric Service Co. E. W. LeNeveu was named secretary.

Goforth was with Southwestern Gas & Electric Co as a substation operator before joining Southwestern Electric Service Co in 1947. He subsequently held several executive posts and has been general sales manager since 1959. In his new post, Goforth will be in charge of sales and industrial development.

LeNeveu, who has been with the company since 1934, was manager of advertising and publicity and assistant in the executive offices prior to his promotion.

◀ CHARLES D. GOFORTH

Four Executives Are Promoted at San Diego G&E

NOBLE SINNOTT ZITLAU DE JONGE

San Diego Gas & Electric Co has promoted Harold A. Noble to senior vice president; J. F. Sinnott to vice president for engineering; Walter A. Zitlau to vice president for production and transmission; and C. P. de Jonge to vice president in charge of distribution.

Noble joined San Diego G&E in 1925 as an engineer in the special construction department. He subsequently became assistant superintendent and then superintendent of electrical production. Noble was named vice president for operations in 1951. He is a member of the board of directors of San Diego Gas & Electric.

Sinnott joined the company in 1930 as a meter tester. He was manager of the engineering department before his promotion.

Zitlau was formerly a manager. He joined San Diego G&E in 1941 as an engineering assistant.

De Jonge joined the company in 1930 as an inspector in the gas department and was a manager prior to his promotion.

Wheaton Elected Fargo Vice President

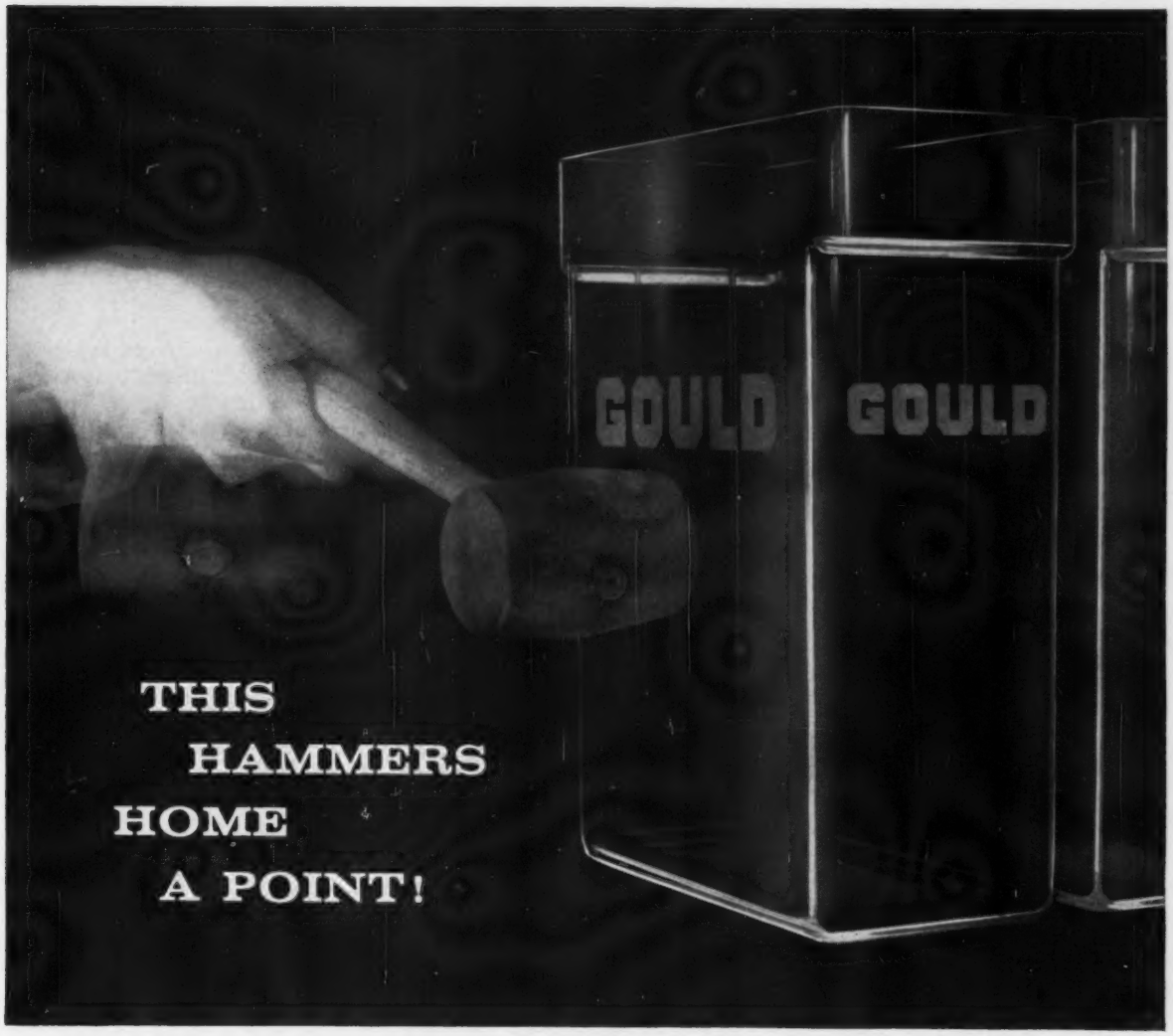
Scott R. Wheaton has been appointed vice president of marketing for Fargo Manufacturing Co, Inc.

Wheaton is a graduate of Duke University. He has also attended Duke's Graduate School of Arts & Sciences.

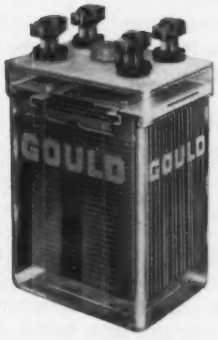
With Fargo since graduation from Duke in 1951, Wheaton's most recent assignment has been as sales manager.

◀ SCOTT R. WHEATON

(*More News About People on page* 60)



Gould Stationary Battery Jars are Practically Indestructible



New Stationary Batteries in Plastrite Jars offer the same long life for which Gould has always been famous.

Gould Plastrite Jars have a higher tensile strength than most Stationary Battery Jars... will withstand greater impact than ever before! This means you'll be free from breakage in handling and shipping.

Plastrite Jars are a feature of Gould's all new batteries for stationary service. Lighter weight makes the jars easier to handle... original shape maintained because of higher heat resistance, higher elongation characteristics of Plastrite material.

Same Capacity, Smaller Size. Gould Plastrite Jars save you 30-40% floor space ... give you the same capacity in a smaller size battery. They're available in Planté, Calcium, and Kathanode. For more details, write today or call your local Gould Office listed under "Batteries—Industrial" in the "Yellow Pages." Gould-National Batteries, Inc., First National Bank Building, St. Paul 1, Minnesota. In Canada, write to Gould-National Batteries of Canada, Ltd., 1819 Yonge Street, Toronto, Ontario.

More Power to You from **GOULD**

Consumers Power Promotes Kettner

KETTNER

Robert Eugene Kettner has been appointed director of nuclear activities for Consumers Power Co. He succeeds Albert L. Bethel who was transferred to a new assignment in Pittsburgh.

Formerly with Westinghouse Electric Corp, Kettner served most recently at the Atomic Energy Commission's national reactor testing station in Idaho on Westinghouse nuclear research projects. Before that, he was assistant manager for Westinghouse of the Shippingport, Pa., nuclear power plant project.

Kettner served with the Air Force special atomic weapons research and development program before joining Westinghouse in 1955.

Dykstra Is Named General Manager

DYKSTRA

L. J. Dykstra has been named general manager of the Pinco Division of Joslyn Manufacturing & Supply Co. Also in Pinco, C. S. Danforth became plant manager and L. J. Grills became manager of sales engineering.

Dykstra has worked for Pinco for 15 years. Before his recent promotion, he was manager of sales engineering. He had previously been employed by the Victor Insulator Co.

Danforth, who was factory superintendent prior to his appointment, has been with the Pinco Division for 25 years.

Grills, with Pinco for five years, was most recently assistant manager of sales engineering.

PERSONAL BRIEFS

Frank E. Kulman, senior engineer with Consolidated Edison Co of New York, Inc, has been elected to the board of directors of the National Assn of Corrosion Engineers.

Former state Assemblyman **Frank J. McMullen** has been appointed a member of the New York Public Service Commission, replacing **Richard H. Balch** who resigned.

W. Lee Mingledorff Jr, former mayor of Savannah, has joined Savannah Electric & Power Co as assistant to the president.

Newly designated as senior associates at Metcalf & Eddy are **Charles G. Hammann, Charles Y. Hitchcock Jr, Albert B. Rich, Morton Solomon,** and **Ariel A. Thomas.**

Pacific Power & Light Co has named **Jack T. Stiles** to succeed **Harold H. Henninger** as administrative assistant to the president. Henninger became assistant general manager. Meanwhile, **E. O. Thoman** succeeded **L. W. Dick** who retired as district manager in Yakima. Also, **Allan C. Bartholomew** became Springfield district manager and was succeeded by **Paul B. McCarthy** as line superintendent for the Springfield-Cottage Grove sector. Also, **Harry F. Pearson** has been named to head the standardization program for overhead distribution.

J. F. Pennington Sr, vice president and general manager of Georgia Power Co, has been elected to the board of directors. **C. B. McManus,** recently retired chairman of Southern Co's board and a former Georgia Power president, was elected an honorary director of the utility.

Earl A. Hanson has replaced **Ralph R. Thomas** who retired manager of the southern Utah division of California-Pacific Utilities Co.

The new president of the Tennessee Rural Electric Cooperative Assn is **William M. Roberts** who succeeded **Floyd Nelson.** Also elected were **Dan Parker** as vice president and **John Dollinger** as secretary-treasurer.

Houston Lighting & Power Co has elected **Carl B. Sherman,** vice president, to the board of directors.

Donald K. Fry has been named assistant to the president of Carolina Power & Light Co, assuming many duties of the late **William L. Yoder.**

Potomac Edison Co has made **Holmes D. Harper** line superintendent at the Winchester, Va., office. **C. Robert Meyer** became assistant supervisor of lighting.

At Community Public Service Co, **Calvin N. Dunlop** became New Mexico division sales manager, succeeding **Vernon Thompson** who resigned. **T. F. Crawford** replaced Dunlop as Clifton manager.

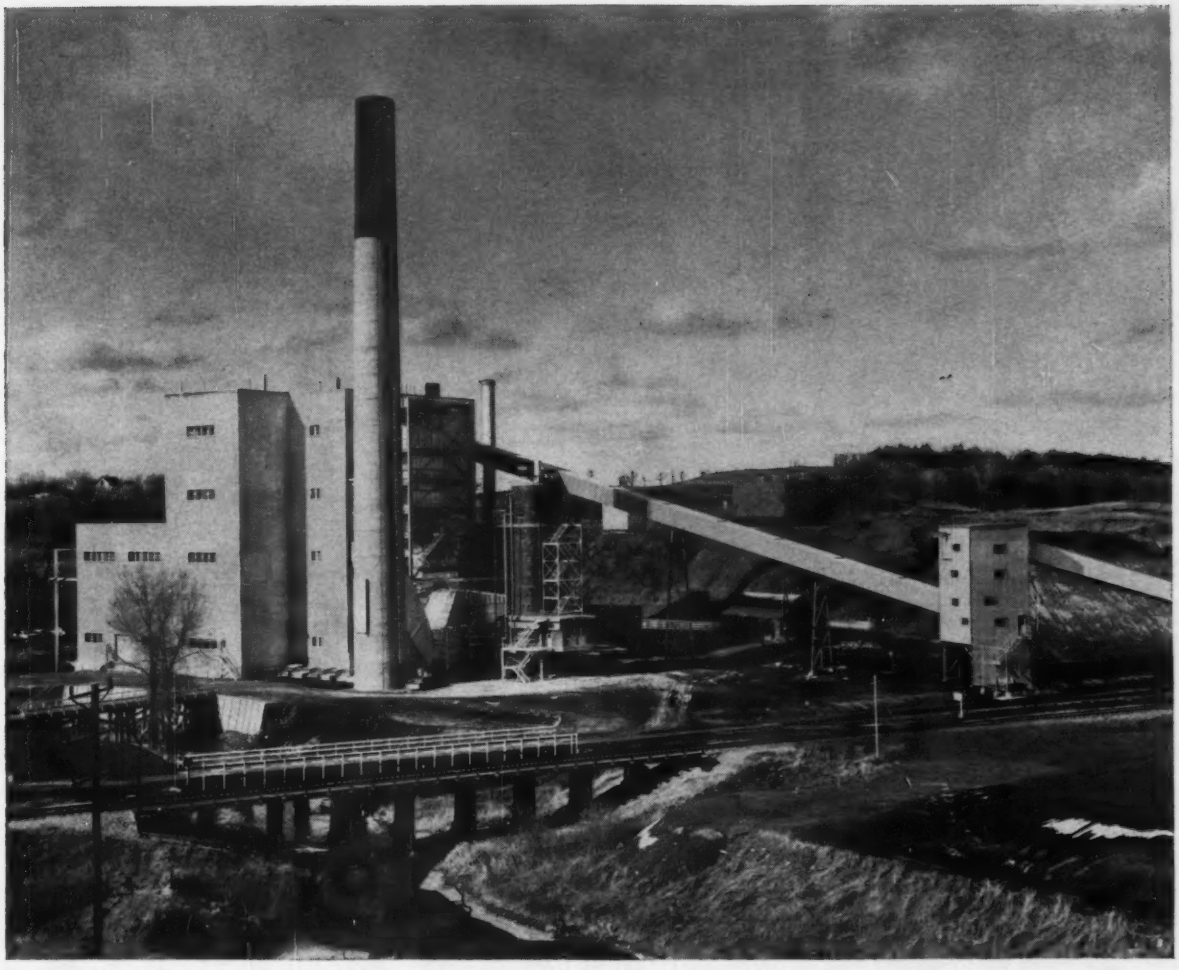
Phil Rosser has become northern division sales manager for Puget Sound Power & Light Co, succeeding **G. L. McDonald** who became central division sales manager. **Bob Richards** was named Bellingham local office manager and **Don Wirt,** Poulsbo manager. PSP&L has also appointed **G. L. McDonald** central division sales manager, replacing the late **Harry B. Batchelder.**

R. C. Hammersmith has been named resident manager for Kaiser Engineers on the Atomic Energy Commission's new production reactor construction project at Hanford, Wash. He succeeds the late **John H. Tacke.**

TRW Computers Co, division of Thompson Ramo Wooldridge Inc, has made **Dan L. McGurk** director of marketing.

Radio Corp of America has named **Meade C. Camp** manager, marketing planning, electronic data processing division, and **J. A. Brustman** manager, electronic systems engineering of the advanced systems development engineering activity in the division.

(*More News About People, p* 62)



Rated at 53,500 kw, Hoot Lake is Otter Tail's newest station. The Otter Tail Power Company serves a 70,000 square mile area in Minnesota, North and South Dakota. Burns and Roe were consulting engineers.

MINNESOTA UNIT FIRES "WET" COAL

. . . Hoot Lake Station burns 1,000 tons of N.D. lignite daily

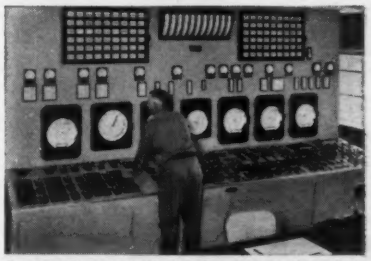
The Otter Tail Power Company's Hoot Lake Station at Fergus Falls, Minnesota, is the largest generating plant in the country burning North Dakota pulverized lignite. The steam generator is the first reheat unit to use lignite as the primary fuel.

Although lignite has a lower initial cost, its high moisture content (30-35%) and low heating value present unusual control problems.

After a year's operation, management is very satisfied with Hagan performance, particularly during several unscheduled outages, when the controls remained on automatic with excellent results. Hagan systems on the unit include combustion, 3-element drum-level, feed-pump, deaerating heater, forced, and induced draft fan control systems.

"Reasons for the selection of Hagan controls," one company official noted, "include satisfactory performance at our other stations, plus the high level of service and instruction provided by Hagan's Regional Service Engineer. We are pleased to have this same proficiency at our Hoot Lake Station."

Look to Hagan for sensible, workmanlike solutions to either special control problems or standard installations. A letter or phone call will put a Hagan engineer to work on your particular problem.



Control Panel at Hoot Lake. Hagan Ring Balance meters and the compact operating console make it easy for a single operator to maintain close control of the operation.

HAGAN
CHEMICALS & CONTROLS, INC.
HAGAN CENTER, PITTSBURGH 30, PA.

HAGAN DIVISIONS: CALGON CO. • HALL LABORATORIES • BRUNER CORP.

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The high, uniform, consistently-dependable quality of Crapo Galvanized Steel Strand is the direct result of close laboratory control over each step in manufacture. All wires used in forming a particular size and grade are produced from steel of selected analysis, carefully processed under technical supervision and stranded on precision machines. Both wire and finished strand are subjected to prescribed laboratory tests to insure the desired end result.

Heavy, uniform, tightly-bonded zinc coatings, applied by the famous Crapo Galvanizing Process, provide maximum resistance to corrosion.

Write for booklet OG-25 containing "Sag and Tension Data for Overhead Ground Wire."

INDIANA

STEEL & WIRE CO., INC., Muncie, Indiana

John W. Haanstra has been promoted to vice president of the general products division of International Business Machines Corp.

Philco Corp has appointed **Nicholas F. Pensiero** manager of marketing administration for the computer division, government and industrial group.

President of Worthington Corp **Walther H. Feldmann** has been named chief executive officer, succeeding **Hobart C. Ramsey,** chairman. Also, **Robert E. Marshall** was elected treasurer, succeeding **W. R. Shook** who resigned to become treasurer of Avon Products, Inc, and **C. Robert Maranville** was elected assistant treasurer.

Howard W. Grossbohlin has been named manager of a recently formed tube products group at Stromberg-Carlson-San Diego, division of General Dynamics Corp.

C. G. Skidmore, sales vice president of the Louis Allis Co, has been elected a director of the National Electrical Manufacturers Assn industrial division.

J. Gilbert Nettleton Jr has been elected vice president, director of marketing, for International Telephone & Telegraph Corp's federal division.

At Burroughs Corp's research laboratories, **Dr Charles Register** has assumed the newly created post of general manager; **R. V. D. Campbell** was promoted to director of research in the office of the vice president of research; **Russell A. Lampman** succeeded Dr Register as manager of the airborne long range input division; and **E. Gary Clark** became Paoli lab manager.

General Motors has promoted **Robert L. Pancoast** to comptroller of the electro-motive division, succeeding **Guy D. Briggs Jr** who was promoted to a post in the overseas operations division.

The recently-named assistant vice president in United Engineers & Constructors Inc's new business department is **Gustave A. Heckscher.**

(*More News About People, p* 64)

Searching for Meter Sockets?

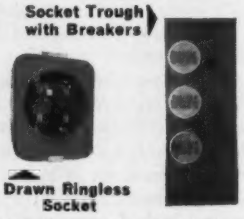
look to...

SUPERIOR SWITCHBOARD & DEVICES CO.

CANTON 1, OHIO

A Subsidiary of

The Union Metal Manufacturing Co.



Write for a free Catalog outlining types and sizes of meter socket equipment, test switches, test blocks, reactiformers and enclosures.

Save on off-road service calls with 1961 FORD 4x4'S

Electrical contractors and public utility companies everywhere are finding that Ford's good-looking 4 x 4's are real money-savers for off-road operations. They have the power and traction to plow through mud, sand, gravel or deep snow and are engineered and built for extra durability.

The F-100 Flareside model is America's lowest-priced* 4-wheel drive pickup with 8-foot box! And for special body installations on chassis-cab models, you save because Ford's 34-inch-wide frame provides for easier installation of standard utility-type bodies. And both the F-100 and F-250 (½- and ¾-ton models) are designed to keep right on saving with *lower* operating and maintenance expenses. You can choose the engine you need—either the gas-saving 135-hp Six, or the 160-hp V-8 that gives extra power and smoothness with "six-like" economy!

And . . . on all 1961 Ford Trucks, each part, except tires and tubes, is now warranted by your dealer against defects in material and workmanship for 12 months or 12,000 miles, whichever occurs first. The warranty does not apply, of course, to normal maintenance service and to the replacement in normal maintenance of parts such as filters, spark plugs and ignition points. Never before have you had such protection . . . such evidence of long-term economy!

*Based on a comparison of latest available manufacturers' suggested retail delivered prices

FORD TRUCKS COST LESS

YOUR FORD DEALER'S "CERTIFIED ECONOMY BOOK" PROVES IT FOR SURE...

FORD DIVISION, Ford Motor Company

NEW 3/4-ton Pull-A-Way
Added to WRIGHT TYPE "C" LINE!

FOUR SIZES • ¾, 1½, 3 and 6 Tons

FEATURES
- Lubricated for life
- Hooks are drop-forged
- Special alloy-steel chains
- Chain sheaves of drop-forged alloy steel
- Gear teeth cut to precision limits
- Load brake is dependable and safe
- Weights: ¾-ton, 12½ lbs. 1½-ton, 23½ lbs. 3-ton, 36½ lbs. 6-ton, 63 lbs.

New 3/4-ton model
• VERSATILE
• LIGHTWEIGHT

ACCO

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Wright Hoist Division
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OBITUARIES

William Leone, 52, assistant director, safety services bureau, Consolidated Edison Co of New York . . . **William R. Wendel,** 55, assistant superintendent, Sunbury power plant, and **Clinton W. Bell,** 75, former technical assistant to the generation superintendent, both at Pennsylvania Power & Light Co . . . **George C. Brooks,** retired manager of employee relations, New York State Electric & Gas Corp . . . **W. H. Fisher,** 49, chief electrical engineer, California-Oregon Power Co.

Charles J. Carapezza, 39, manufacturing engineer, and **James K. Kennedy Jr,** 46, an engineer, both of General Electric Co . . . **Herbert C. Feuers,** 77, former manager of Sedalia, Mo., Light & Traction Co . . . **Clyde O. Carpenter Jr,** 52, commercial manager, Knoxville Utilities Board . . . **Malvern Hill Terrell,** 75, general manager and plant superintendent, Virginia Electric & Power Co . . . **Robert Edge,** 55, chief engineer, Columbus, Ohio, municipal light plant.

Clifford Winner, 66, retired treasurer, and **Harry R. Hazzard,** 69, retired cost accountant, property record section, both of Philadelphia Electric Co . . . **William B. Harl,** 71, former line foreman, Public Service Co of Oklahoma . . . **Barry Dibble,** 79, former consultant to Bonneville Power Administration and BPA assistant administrator . . . **Herald N. Cole,** 66, former credit and collections supervisor, Tacoma Department of Public Utilities . . . **Tom P. Walker,** 69, former manager, Baton Rouge Electric Co . . . **Wesley S. Walker,** 56, sales manager-carbide, Union Carbide Olefins Co . . . **Charles J. Ferguson,** 66, former assistant secretary, American & Foreign Power Co . . . **Louis F. Heckmann,** 63, vice president of sales, Union Metal Manufacturing Co . . . **LeRoy Engstrom,** 54, Tennessee Valley Authority river control branch chief . . . **Julian K. Sprague,** 57, president, Sprague Electric Co.

Joseph C. Langdell, 74, retired senior meter consultant, Commonwealth Services, Inc . . . **Donald M. Simmons,** 71, former vice president and a director, General Cable Corp.

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. . . properly designed to cool power and distribution transformers

Designed and built by the pioneers and specialists in economical, dependable self-cooling methods. Sizes and models for any make transformer. Valves, flanges, elbows available. Transformer tanks built to customer's design.

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HAI-2

"I hate to spend money on switchgear maintenance!"

Who doesn't. That's why I-T-E designed this completely new 13.8 kv switchgear so that your maintenance costs can be lower than ever.

For example, this is the first 13.8 kv switchgear designed exclusively for stored energy closing. That means it closes fast every time. Contacts last longer, and that keeps down the upkeep. I-T-E's unique ratchet and pawl stored energy mechanism eliminates the need for a brake or clutch which would require periodic maintenance.

The breaker is more compact and actually hundreds of pounds lighter in weight than the previous model. So it's easier to move around, has a lower center of gravity. And one man can do all the maintenance work, including raising the arc chutes and maneuvering the frame.

All secondary wiring is in the front—away from the high voltage bus. You can service it without shutting down the board. Access to instruments is through a separate door to an isolated compartment, for still greater safety.

Low-cost maintenance is only one of the economy features of this new I-T-E 13.8 kv switchgear. It saves space —roughly 30 cu. ft. per frame. Stored energy means you can use a smaller battery or transformer for closing. And you can disconnect the breaker without opening the front doors—saving time in routine operations.

If you are about to specify 13.8 kv switchgear, make sure you get all the advantages only this I-T-E equipment offers. See the new illustrated Bulletin 2800-2B. Call your nearby I-T-E sales office. Or write I-T-E Circuit Breaker Company, 1900 Hamilton St., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT: BUSINESS: **"OPPORTUNITIES"** :EQUIPMENT :USED OR RESALE

DISPLAYED RATE: —RATES— **UNDISPLAYED RATE:**

EMPLOYMENT OPPORTUNITIES: $25.50 per inch. Subject to Agency Commission.

EQUIPMENT & BUSINESS OPPORTUNITIES: $16.85 per inch for all advertising appearing on other than a contract basis. Not subject to Agency Commission.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.

EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

$1.80 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

PROPOSALS, $1.80 a line an insertion.

BOX NUMBERS count as one line additional in undisplayed ads.

DISCOUNT OF 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

Send New Advertisements to Classified Advertising Div. of Electrical World, P. O. Box 12, N. Y. 36, N. Y.

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Electrical Equipment Representatives
Write for free copy of EERA Directory
C. W. SWARD, Executive Director EERA
1675 Fifth St. Clermont, Florida

LARGE POWER EQUIPMENT
Prompt Stock Shipment
RENUBILT MOTORS - GENERATORS
TRANSFORMERS - CIRCUIT BREAKERS
DO YOU GET OUR STOCK LIST?
BELYEA COMPANY, INC.
51 Howell St. Jersey City, N. J.
OL-3-3334

ADDRESS BOX NO. REPLIES TO: Box No. Classified Adv. Div. of this publication. Send to office nearest you.
NEW YORK 36: P. O. Box 12
CHICAGO 11: 520 N. Michigan Ave.
SAN FRANCISCO 11: 255 California St.

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Electrical Engineer familiar with electric power systems. Permanent employment with opportunity for advancement in long-established consulting engineering firm. Write or call Stanley Engineering Company, Muscatine, Iowa.

Construction Supervision. Construction Engineer for inspection and supervisory work on electric power lines and substations. Opportunity for permanent employment and advancement with well-known consulting engineering firm. Send resume to P-6001, Electrical World.

Communications Engineer: Graduate Electrical Engineer with minimum of three years experience in microwave, carrier and two-way radio systems. Position located in San Bernardino in Southern California close to the beaches, mountains and desert resorts. If interested in expanding company with excellent future possibilities, submit complete resume of education, experience and salary requirements to the Personnel Department, California Electric Power Company, P.O. Box 1029, San Bernardino, California.

Your Inquiries to Advertisers Will Have Special Value . . .

—for you—the advertiser—and the publisher, if you mention this publication. Advertisers value highly this evidence of the publication you read. Satisfied advertisers enable the publishers to secure more advertisers and—more advertisers mean more information and more products or better service—more value— to YOU.

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Nearest You

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COngress 2-1160

CHICAGO, 11
520 No. Michigan Ave.
MOhawk 4-5800
W. J. HIGGENS - W. SONZSKI

CLEVELAND, 13
1164 Illuminating Bldg.
SUperior 1-7000
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DALLAS, 2—1712 Commerce St., Vaughn Bldg.
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1700 Broadway—Tower Bldg.
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LOS ANGELES, 17—1125 W. 6th St.
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OXford 5-5959
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Six Penn Center Plaza
LOcust 8-4330
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PITTSBURGH, 22—4 Gateway Center
EXpress 1-1314
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Reports, Design, Supervision of Construction
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1500 Meadow Lake Parkway
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THEODORE D. BROSS
LINE CONSTRUCTION CORP.
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COMMONWEALTH

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Subsurface investigations for all types of buildings, heavy equipment, and tower foundations. Ground motion, earthquake, and vibration analyses. Earth dam and earthwork design and inspection.
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Cost Trends—Special Studies—Reports for Rate Cases, Security Issues, Regulatory and Accounting Requirements
Michigan Theatre Building Ann Arbor, Michigan
NOrmandy 8-7778

PIONEER SERVICE & ENGINEERING CO.
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Specialists in Financing
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SANBORN MAP COMPANY, INC.
Nation Wide Mapping Services
• Utility Area Base Maps
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Industrial Plants • Process
1233 North Second Street Abilene, Texas
214 Meadows Building Dallas, Texas

new I-T-E aluminum air break switch base

70% lighter... costs no more than steel

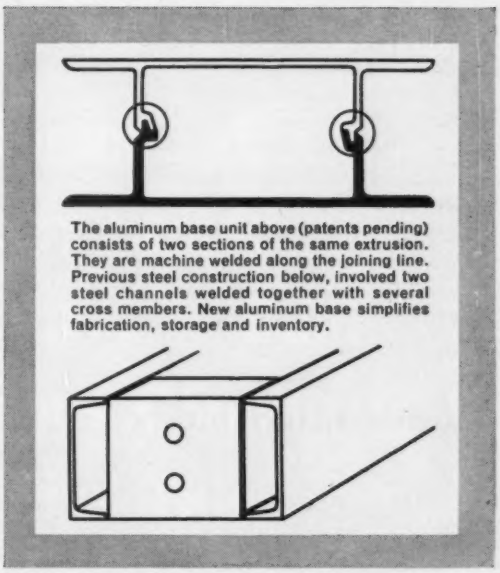
This new box section base (patents pending) designed in aluminum actually increases torsional rigidity over the present steel design. This results in a smaller degree of deflection under short-circuit conditions. It can also be installed with greater overhang which means more flexibility in installation. Reynolds engineers worked very closely with the I-T-E Circuit Breaker Company in designing the extrusion that made this economical box section possible. And, because it is aluminum, it resists corrosion and can't rust—ever. Result: lower *initial* cost—lower *final* cost—maximum life and improved appearance.

This new concept has been developed for switches in the 69KV class and up. For lower voltage ratings a series of extruded shapes have also been developed.

Regardless of whether you purchase or manufacture electrical equipment, aluminum's unique combination of advantages can be of value to you. Some of these advantages are: low cost, minimum maintenance, easier installation, attractive appearance, high thermal conductivity, strength, ease of fabrication, good availability and high scrap value.

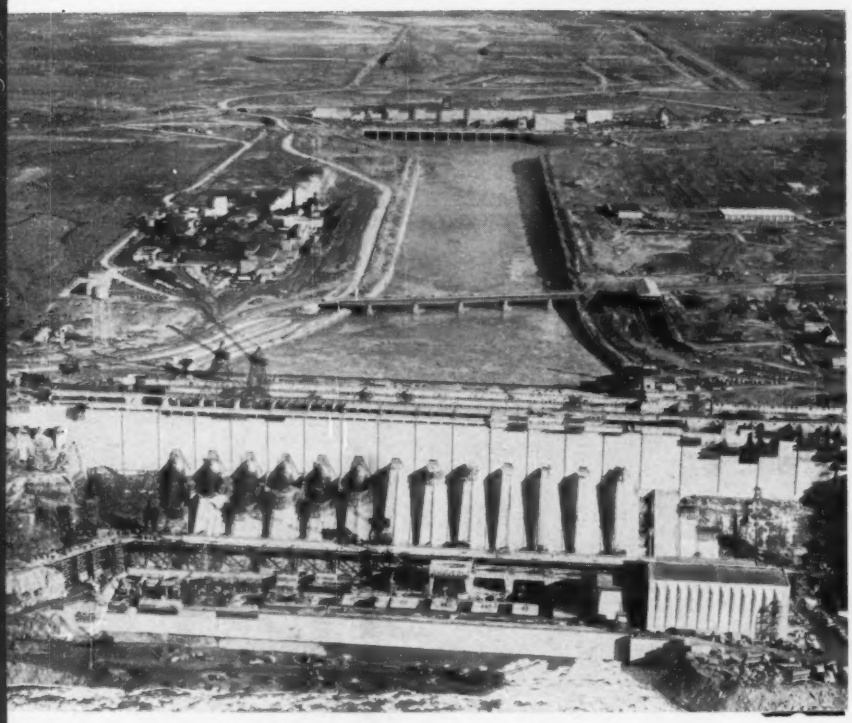
For specific information and advice on how aluminum can help *you*, contact your nearest Reynolds Sales Office. Or, write *Reynolds Metals Company, Box 2346-EL, Richmond 18, Virginia.*

REYNOLDS ALUMINUM



The aluminum base unit above (patents pending) consists of two sections of the same extrusion. They are machine welded along the joining line. Previous steel construction below, involved two steel channels welded together with several cross members. New aluminum base simplifies fabrication, storage and inventory.

Watch Reynolds TV show "Harrigan & Son" Fridays; also "All Star Golf" Saturdays—ABC TV



First Power Flows at Niagara Project

The first 150-Mw unit of the Niagara Power project, largest hydro installation in the free world, started producing commercial power Feb. 10. When it is completed in 1963, the project will have a total capacity of 2,190 Mw, some 216 Mw more than Grand Coulee. Shown above are partially completed Robert Moses power plant, in the foreground, and the flooded power canal, leading to the reservoir pump-generating plant at the rear. The Moses Plant contains 13 150-Mw units, the largest of this type ever built by an American manufacturer. The pumped generating plant includes 12 units, each of which can pump 3,400 cu ft of water into the reservoir and produce 20 Mw of power when reversed. Earlier the same day, three investor owned utilities, eight municipal electric systems, and one rural cooperative signed power contracts with the Power Authority of the State of New York, builder of the $720-million project.

Towers Anchored in Muskeg

(*Continued from page* 37)

tory. Under the muskeg condition, the soil cement, being very sensitive to moisture content variation, cannot be relied upon for consistent performance. The unsatisfactory results obtained with inclined plate and expansion anchors can be attributed to sloughing and caving-in of the augered holes during installation and backfilling. The difficulties were more pronounced for the larger diameter holes.

The muskeg at Abitibi Canyon consists of a fine fibrous woody peat varying in depth from 4 to 7 ft. At Smooth Rock Falls, the 2 to 4 ft of peat contains a higher percentage of coarse woody fibrous material.

The muskeg at the two sites investigated, because of its woody and fibrous structure, is not as difficult to traverse as the finer, more amorphous-structured muskeg formed from a highly mossy vegetation. Although the coarser muskeg does present many problems in transportation and access for line construction, these difficulties may be avoided by conducting the work during the winter months.

The underlying soil of glacial origin consists mainly of till overlaid by shallow lacustrine deposits of silt. Abitibi Canyon consists of a dense till of high strength and bearing capacity. The strength of the till at the Smooth Rock site, although less than that of the soil at Abitibi Canyon, is still adequate to support tower structures. The strength of the overlying silt deposits generally increases with penetration into the silt.

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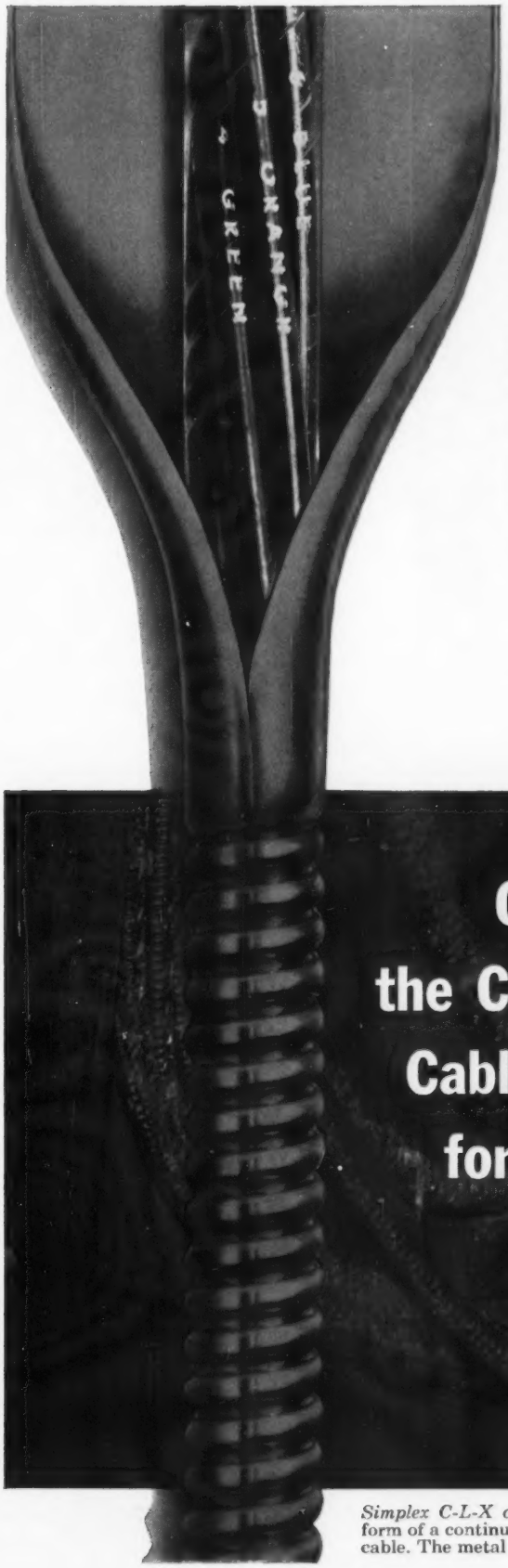


The cable you see here is *not* interlocked armor. It is Simplex' new C-L-X . . . the completely sealed cable system.

- Completely sealed against liquids and gases.
- Protected against mechanical damage by a continuous, corrugated metallic sheath.
- As pliable as unsheathed cable because of its corrugated design.
- Needs no separate duct or conduit in any environment.
- Nonferrous sheaths can be designed to function as grounds or shielding.

Simplex C-L-X is impervious to liquids and gases, is resistant to all forms of mechanical damage, and is as pliable as unsheathed cable.

Available with sheaths of steel, aluminum, copper or bronze, and with or without outer plastic jacketing, Simplex C-L-X provides the ideal solution for almost any installation, particularly those in which cable life is limited by severe ambient conditions.

Write today for illustrated brochure containing application and engineering information.

Simplex

WIRE & CABLE CO.

Cambridge, Mass. • Newington, N. H.

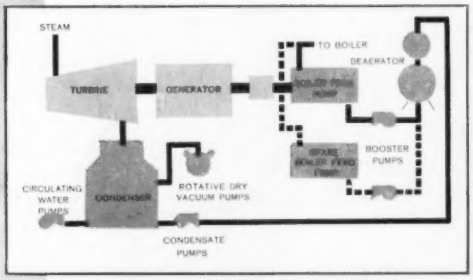
Only Simplex C-L-X . . . the Completely Sealed Cable System . . . is Built for Torturous Conditions Like This

Simplex C-L-X combines cable and duct in one integrated system. Metal, in the form of a continuous flat strip, is formed into a welded tube around the insulated cable. The metal tube is then corrugated to form Simplex C-L-X.

1959's MOST EFFICIENT PLANT

Worthington equipment plays major role in PEPCO achievement

According to the recently issued Federal Power Commission report, Potomac Electric Power Company's Dickerson Station was the most efficient power plant in the U.S. in 1959. PEPCO Engineering Departments worked with Stone & Webster Engineering Corporation to achieve a new low heat rate. Worthington helped by supplying major components in the Fluid Handling Group.



Major fluid handling equipment (shown in red) includes the condensers, circulating water pumps, condensate pumps, rotative dry vacuum pumps, boiler feed and booster pumps and main deaerator to supplement condenser deaeration in protecting the boiler and feed cycle.

The fluid handling equipment incorporates a number of special features. Included is the power-saving technique of a single full capacity boiler feed pump driven from the main turbine generator shaft through a variable speed coupling. There is a spare turbine driven feed pump.

Two duplicate 175 mw units are now in commercial operation. Similar equipment will be furnished for Unit No. 3 scheduled for 1962 operation.

Worthington's successful role at PEPCO Dickerson is the result of "system-wise experience" that Worthington offers as an aid in planning any power project. For information, call your nearest Worthington District Office. Or write to Worthington Corporation, Section 45-19, Harrison, N.J.

WORTHINGTON

PRODUCTS THAT WORK FOR YOUR PROFIT